

MICROLINE 320/321 Elite IBM/EPSON Compatible PRINTER Maintenance Manual

(OEL)

[Rev. 3]

Related drawings

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41735101TR	ML320/321Elite(OEL) RSPL

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PREFACE

This maintenance manual describes field maintenance of the MICROLINE 320/321 Elite printer and options for maintenance engineers.

For performance specifications and operating procedures, refer to the "User's Manual".

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1. CONFIGURATION

1.1. Standard Printer Configuration

The standard configuration of the MICROLINE 320/321 is as follows.

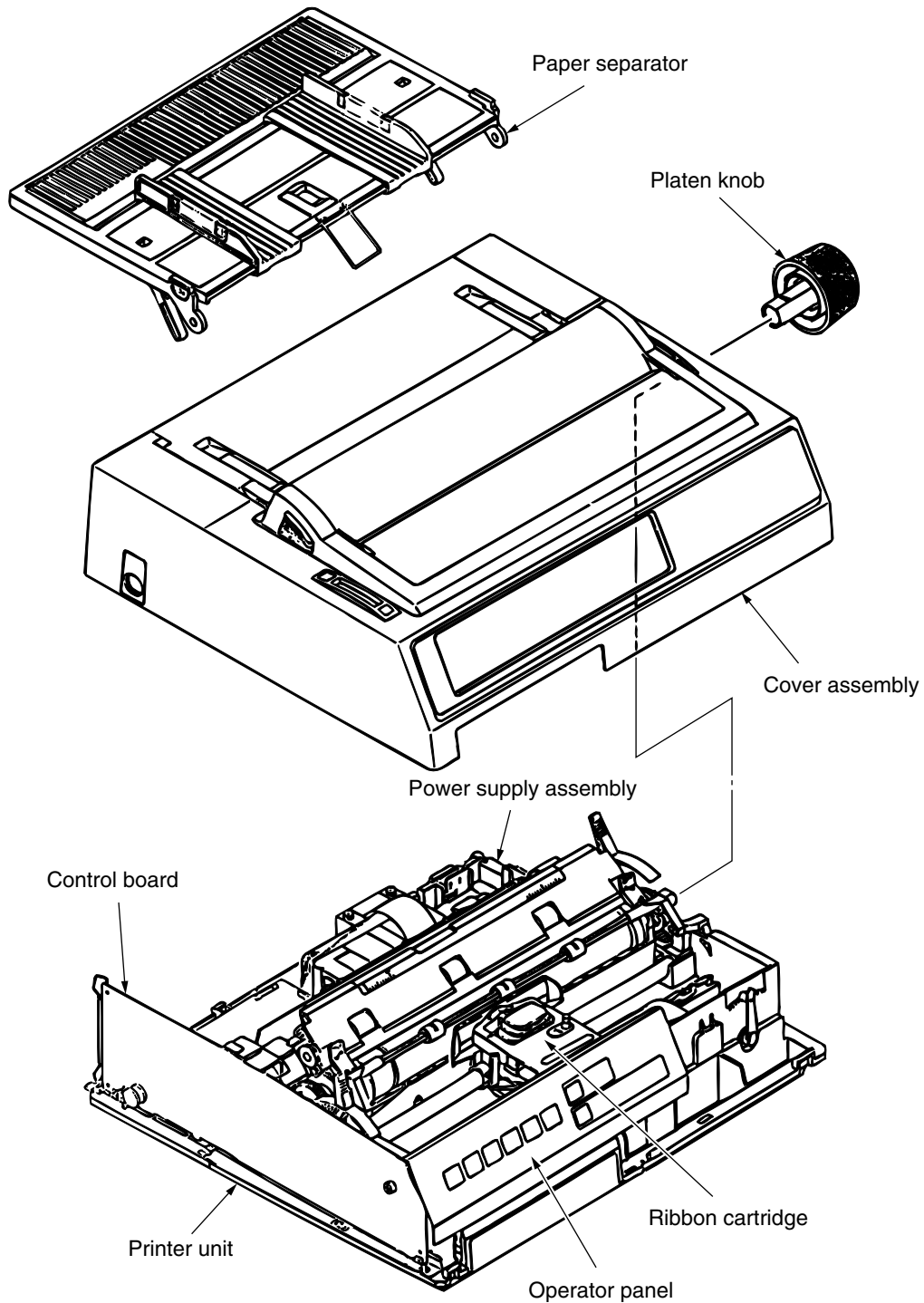
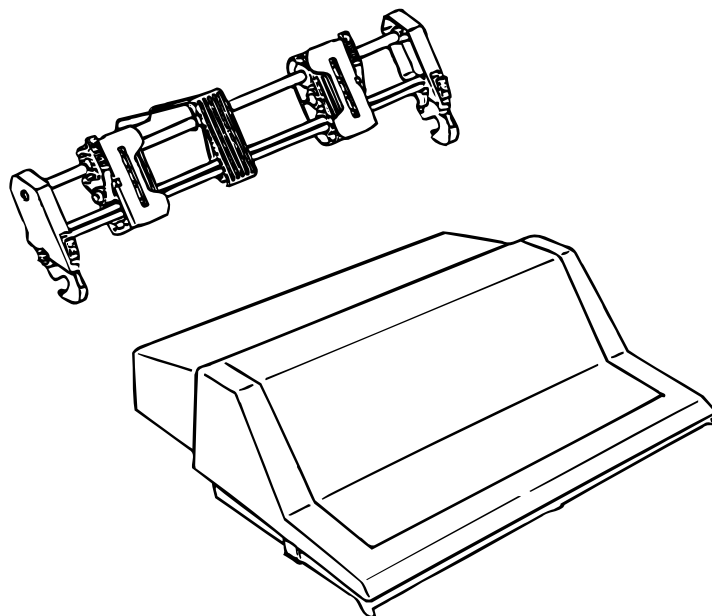


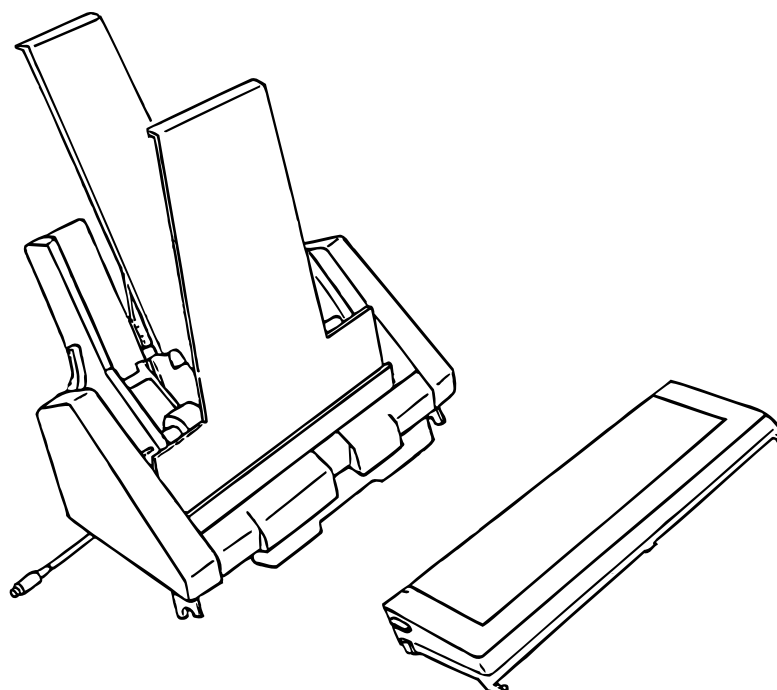
Figure 1-1 Printer Configuration

1.2 Options

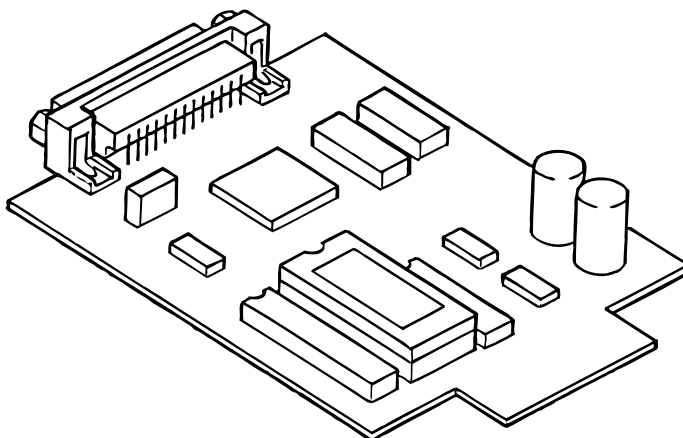
- (1) Pull tractor feed unit with acoustic cover



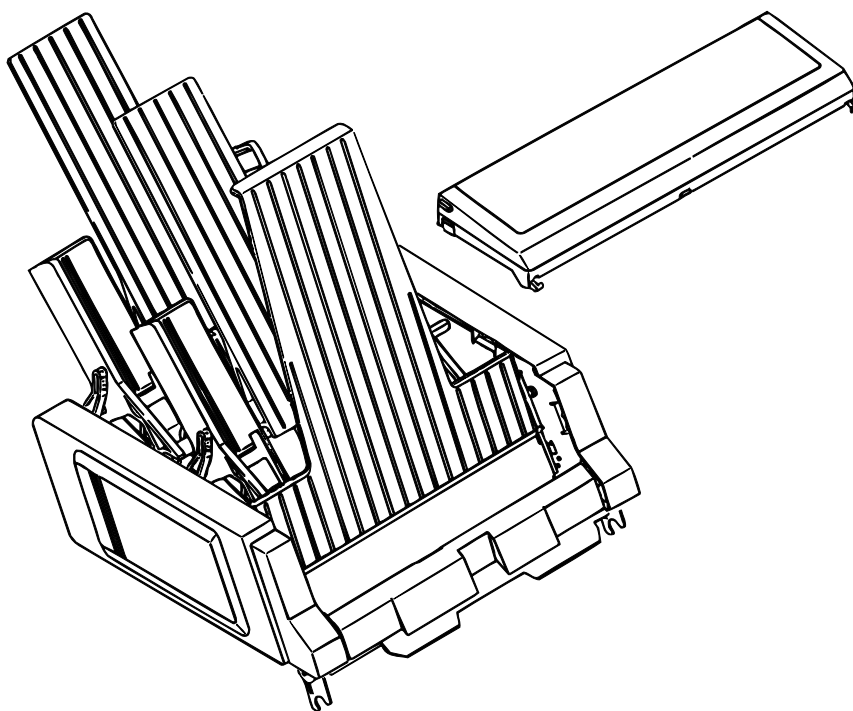
- (2) Cut-Sheet Feeder unit with access cover



(3) RS-232C serial interface board



(4) Dual cut-sheet feeder unit with access cover



2. THEORY OF OPERATION

2.1 Electrical Operation

This section describes the operation of the printer circuits.

2.1.1 General

The block diagram of the printer circuit is shown in Figure 3-1.

On the control board are mounted not only the microprocessor and its peripheral circuits but also the drive circuits, paper end sensor and interface connector.

The power supply is connected to the control board via the DC power supply board. Other electrical parts are connected via the connection board.

2.1.2 Microprocessor and peripheral circuits

(1) Microprocessor (Q7 : 80C154)

The microprocessor is the nucleus of the control circuit. Its peripheral circuits operate under control of this microprocessor. The I/O ports of the microprocessor are connected with the address bus, data bus, and control lines.

(2) Program ROM (Q13)

The program ROM stores the control program for the printer, and stores the character fonts.

The microprocessor operates under the control of this program.

(3) RAM (Q9 and Q12)

The RAM stores data such as received print data, and stores all character fonts. Q12 has battery backup even after power is off.

(4) LSI (MSM6990) (Q11)

The MSM6990 is an external interface and motor control LSI. It has the following functions.

A : External interface controller

(a) Parallel interface function

The parallel interface function mode is selected when the level of the mode selection signal (ISEL) is high. In this mode, IFD1 to 8 are used as an input port; they are used as an output port when the serial interface board is connected; the parallel data received through the interface connectors is latched in synchronization with the strobe signal ($\overline{\text{STB}}$) and is sent to the CPU in synchronization with the RD signal. In this mode, the MSM6990 also sends $\overline{\text{BUSY}}$, ACK, $\overline{\text{PE}}$ and $\overline{\text{SELECT}}$ signals to the interface connector in synchronization with the $\overline{\text{WR}}$ signal.

(b) Serial interface function (not used)

The ISEL signal goes low and the serial interface function mode is selected. In this mode, the MSM6990 sends $\overline{\text{SSD}}$, $\overline{\text{RTS}}$, and $\overline{\text{DTR}}$ signals to the interface connector in synchronization with the $\overline{\text{WR}}$ signal.

B : Motor controller

(c) Spacing speed control function

This function accelerates and decelerates the spacing motor in accordance with commands from the microprocessor and controls the spacing motor speed in each printing mode.

(d) Dot timing generation function

This function generates the dot-on timing signal (\overline{IPT}), synchronized with the printing speed in accordance with output signals (PHASE A, B) of the encoder on the spacing motor, and sends this timing information to the microprocessor.

C : D-RAM controller

(e) Executes refresh and read/write of D-RAM (Q9) by RAS, CAS 1 to 3, DRAM A0 to A7 signals.

D: Other functions

(f) I/O ports

The MSM6990 has a 12-bit output port and a 10-bit input port. It outputs control signals in accordance with the commands input from the microprocessor.

The input port is also used to read information on the printer's condition.

(g) Address latch

The address latch latches the low-order 8 bits of the address bus (A0 to A7). These bits are used as an address for read/write operations with peripheral devices.

(h) Address-decoder

The address decoder decodes the address signal, and sends out the RAM (Q12) chip select signal ($\overline{SRAMSEL}$).

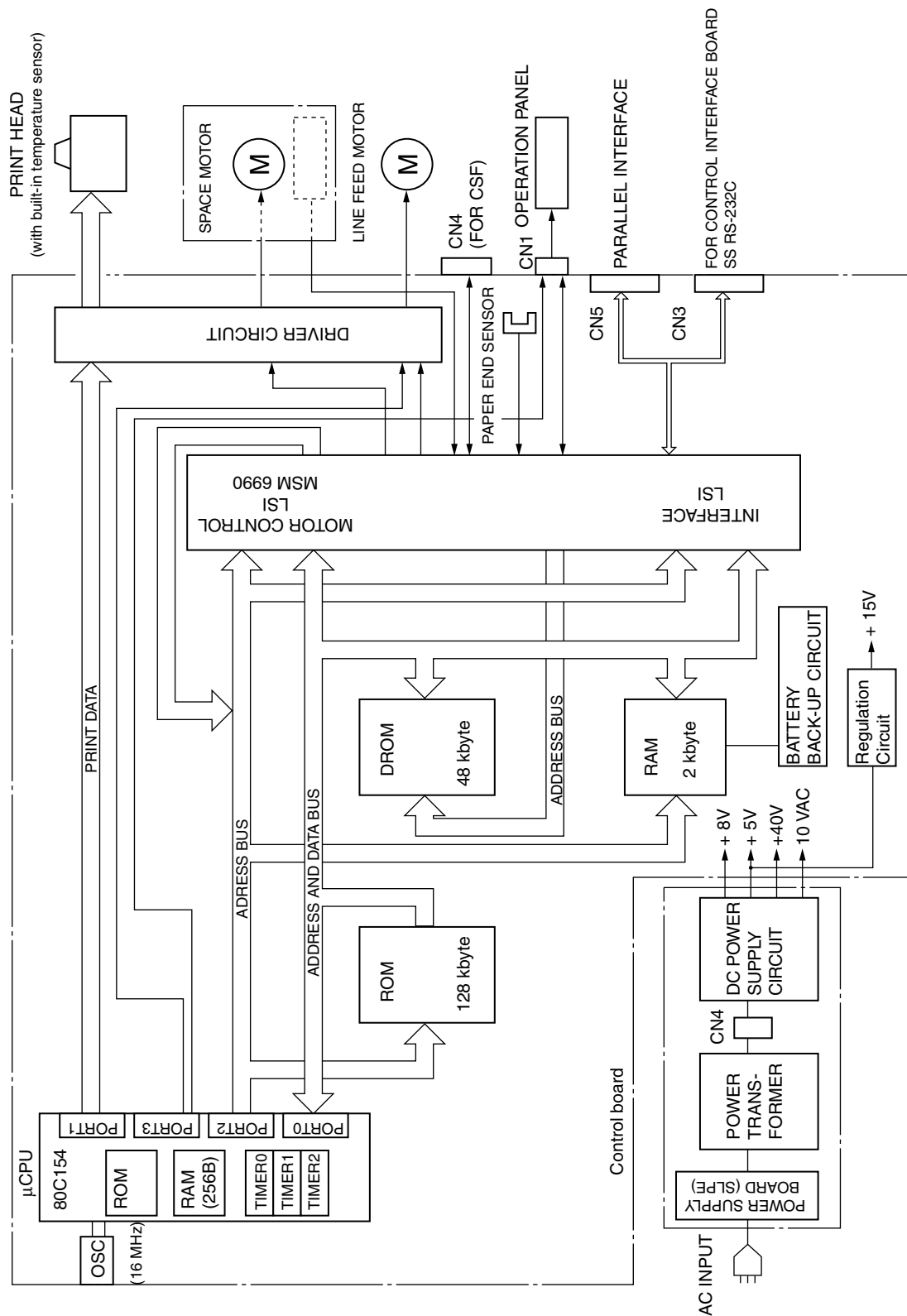


Figure 2-1

2.1.3 Initialization

The printer is initialized when the power is turned on or when the parallel interface signal, I-PRIME, is received from the host computer.

Initialization is started when the RST OUT signal is sent from the reset circuit (Q6 pin 14) to Q11 and Q7, and SRST OUT is sent to each device.

When the reset is completed, the program starts with mode setting of Q11, and Q6, a memory (ROM and RAM) check, RAM initialization, and then carriage homing. The program finally establishes the interface signals (output of ACK signal, BUSY signal, etc.), lights the SELECT indicator, and informs the host computer that the printer is ready to receive data (in the data reception wait state), thus completing the initialization.

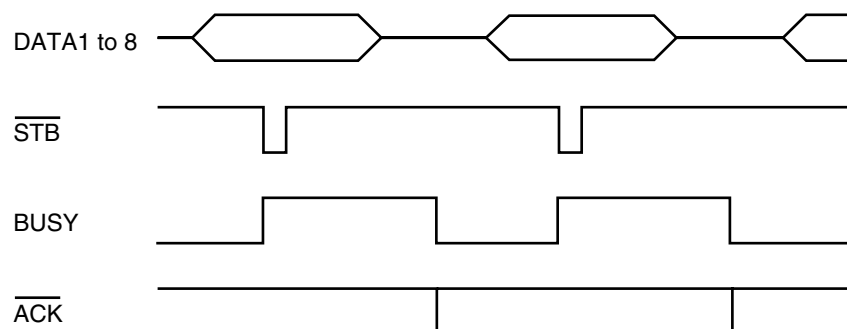
2.1.4 Interface control

(1) Parallel interface

The data from the interface is input through connector (CN5), and the interface LSI (Q11 : MSM6990) latches this input data in sync with STB signal.

The BUSY signal is on during processing of this data. When the processing is completed, the BUSY signal is turned off, and an $\overline{\text{ACK}}$ signal is sent to request more data.

The BUSY signal is also sent to stop data sending when data cannot be received because the receiving buffer is full, etc.

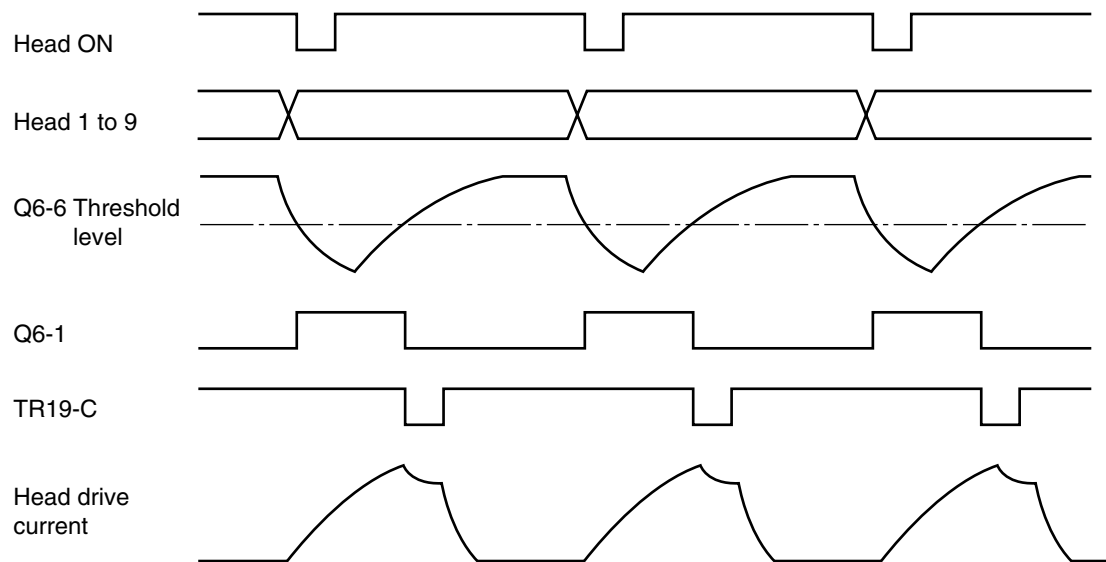


2.1.5 Printhead drive circuit

This circuit drives the head magnets corresponding to the HEAD DATA1 to 9 signals in accordance with the HEAD-ON signal, to make the printhead print characters.

When the HEAD-ON signal goes low, the RC integrator determines the head drive time. This integrator automatically compensates the printing pressure in accordance with the drive voltage (+40V).

That is, the integrator elongates the drive time if the drive voltage lowers, and shortens the drive time if the drive voltage rises.



2.1.6 Spacing operation

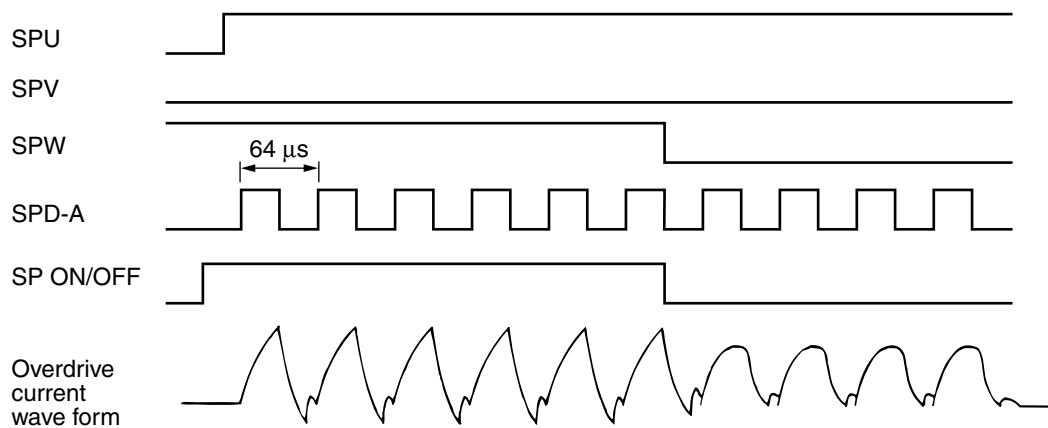
(1) Spacing motor control

The motor control LSI (Q11 : MSM6990) outputs the spacing motor phase signals (SPU, SPV, and SPW) in accordance with the spacing command from the microprocessor, and at the same time outputs the overdrive signal (SPD-A).

The SPD-A signal is a fixed-period pulse signal whose pulse width is controllable by the program, and is used to control the motor drive time.

The SP ON/OFF signal is used when acceleration and deceleration require a larger torque.

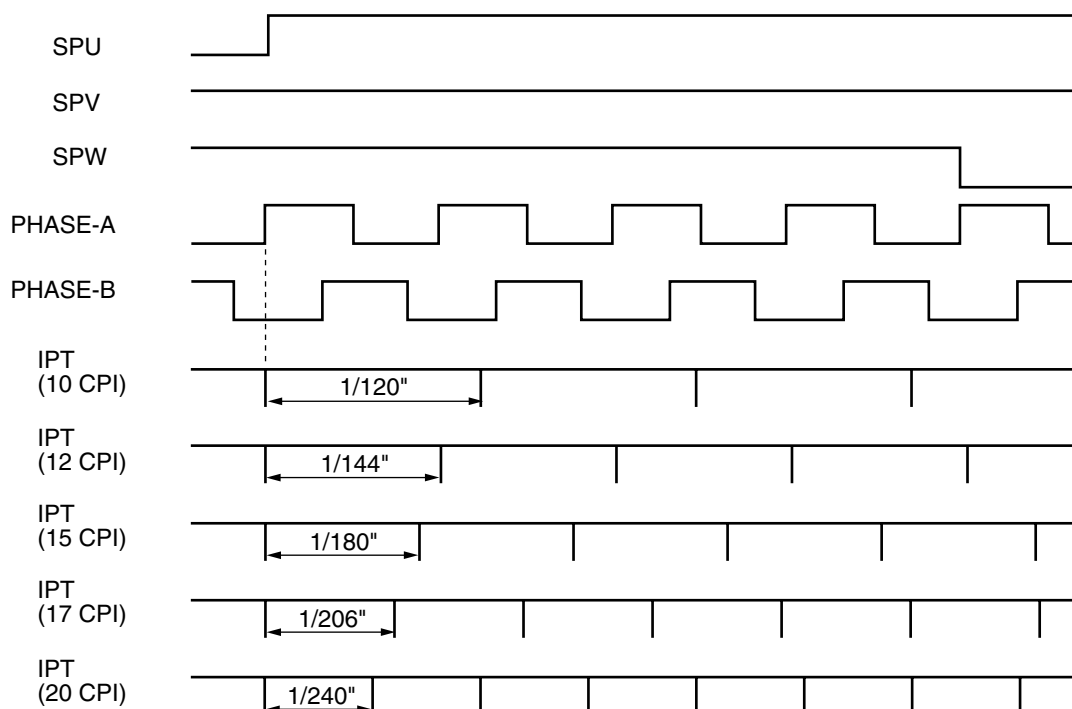
The motor driver (MTDV) drives the spacing motor in accordance with these signals. Pins 19 of the MTDV are for the protective circuits against overcurrent.



(2) Encoder disk

In the operation of the spacing motor, the PHASE-A and PHASE-B signals are generated when the encoded disk interrupts the photosensor.

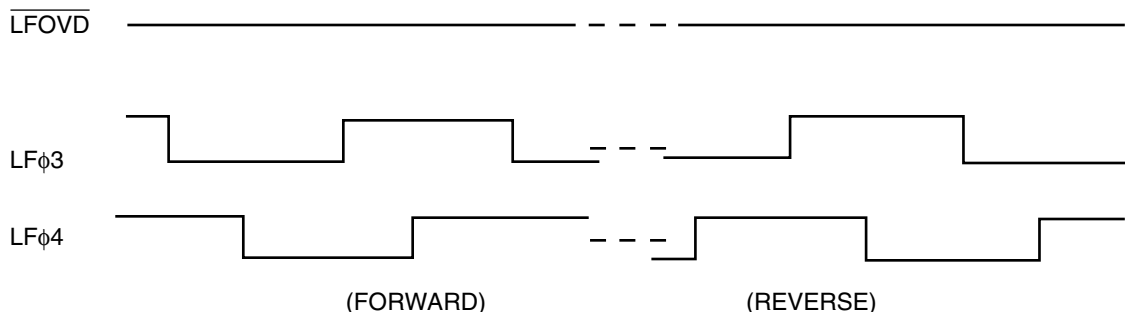
The motor control LSI (Q11 : MSM6990) frequency divides these edge pulse signals in accordance with the print pitch, and sends the $\overline{\text{IPT}}$ signal to provide dot-on timing and carriage position detection timing.



2.1.7 Line feed operation

The line feed motor is held stationary with the LF HOLD signal (minute holding current : approx. 25 mA) while it is at a stop.

During line feed operation, the line feed motor is driven by a large current supplied in accordance with the LF OVD signal.



2.1.8 Alarm circuits

(1) Drive circuit fault alarm

This is a protective circuit which causes the AC fuse to open when a fault occurs in the printhead drive circuit, space motor drive circuit, or their peripheral circuits, thus preventing component failure.

For this purpose, this circuit monitors the drive time using the HDALM signals interlocked with the overdrive signal of each drive circuit. If the drive time of any drive circuit exceeds the specified time, the drive circuit fault alarm circuit sends an ALM signal (high) to turn on the SCR (on the PSU).

This causes the secondary coil (+ 40 V) of the transformer to be short-circuited, causing an overcurrent to flow through the primary coil to open the AC fuse.

(2) Printhead overheat alarm circuit

In order to protect the head coils, this circuit monitors the head temperature using the built-in printhead thermistor.

If heavy-duty printing is performed continuously for a long time, the printhead temperature rises. When the head temperature reaches a certain value (about 100°C), a head overheat alarm is detected.

When the alarm is detected, the printing operation is halted to wait for the head temperature to fall. When the head temperature returns below the alarm detection temperature, the printing operation is restarted.

The alarm detection is performed as follows:

When the temperature in the printhead rises, the resistance of the thermistor falls and the potential of the comparator (Q6) negative input falls to invert the comparator output, thus causing the HEAD TEMP signal to be sent to the motor control LSI.

2.1.9 Paper end detection circuit

When the paper runs out or is not installed, the photosensor (PE) on the control board is turned off as a result the $\overline{\text{PAPER END}}$ signal becomes low. This signal is fed to pin 55 of the motor control LSI (Q11), causing the printing operation to be stopped and the ALARM indicator to light.

2.1.10 Power supply

The power supply consists of a power transformer, a filter board, and a DC power supply board.

The input AC voltage is transformed into 8.6 VAC, 46 VAC and 10 VAC by the power transformer.

These AC voltages are rectified into + 8 VDC, + 5 VDC, and + 40 VDC levels by the DC power supply board and supplied to the control board.

(1) Filter board

The filter board includes the power switch, AC fuse and AC noise filter.

(2) Power transformer

If the power transformer temperature rises abnormally then the built-in temperature fuse of the transformer open to prevent any damage to other components.

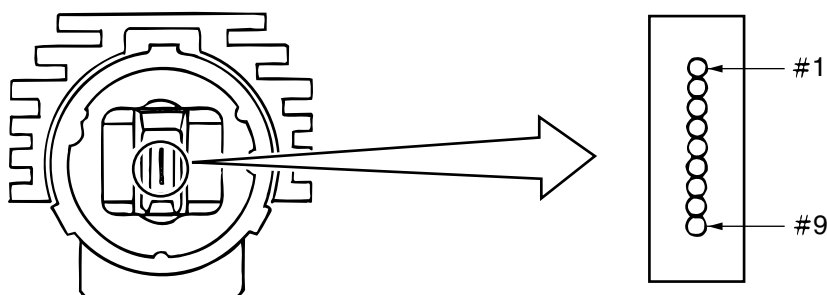
(3) Power supply board

Transforms the AC voltage input to DC voltage (+ 8 VDC, + 5 VDC and + 40 VDC) and supplies it to the control board.

2.2 Mechanical Operation

2.2.1 Printhead mechanism and operation (See Figure 2-2.)

The printhead is a spring charged 9-pin driving head using a permanent magnet. It is attached to the carriage, which moves in parallel with the platen. Electrically, this unit is connected to the control circuits through the main pc board.



**Figure 2-2 Arrangement of the head pins
View from the tip of the printhead**

(1) The printhead configuration:

The printhead is composed of the following parts:

- (a) Wire guide
- (b) Print wires
- (c) Armature assembly
- (d) Yoke
- (e) Spring
- (f) Spacer
- (g) Magnet assembly
- (h) Thermistor
- (i) Printed circuit board

(2) Operation of printhead (See Figure 2-3.)

When the printhead is idle, the armature is attracted by a permanent magnet and the spring fixing the armature is compressed. The print wires fixed to each armature are thus concealed under the wire guide.

When a signal for a character to be printed is detected, a current flows through the coil. When the coil is activated, the magnetic flux (caused by the permanent magnet between the armature and the poles) is canceled to eliminate the attraction force. The armature is driven in the direction of the platen by the force of the armature spring. The print wire fixed to the armature protrudes from the tip of the wire guide, strikes the paper through the ribbon and prints a dot on the paper.

After the character has been printed, the armature is magnetically attracted again and the print wires are again concealed under the wire guide.

A thermistor in the printhead prevents burning caused by over-heating of the coil during extended continuous bi-directional printing. When the temperature of the coil exceeds a predetermined limit (about 110°C) the control circuit detects a thermistor signal. Printing will then be intermittent or stop completely until the coil temperature falls below the limit value.

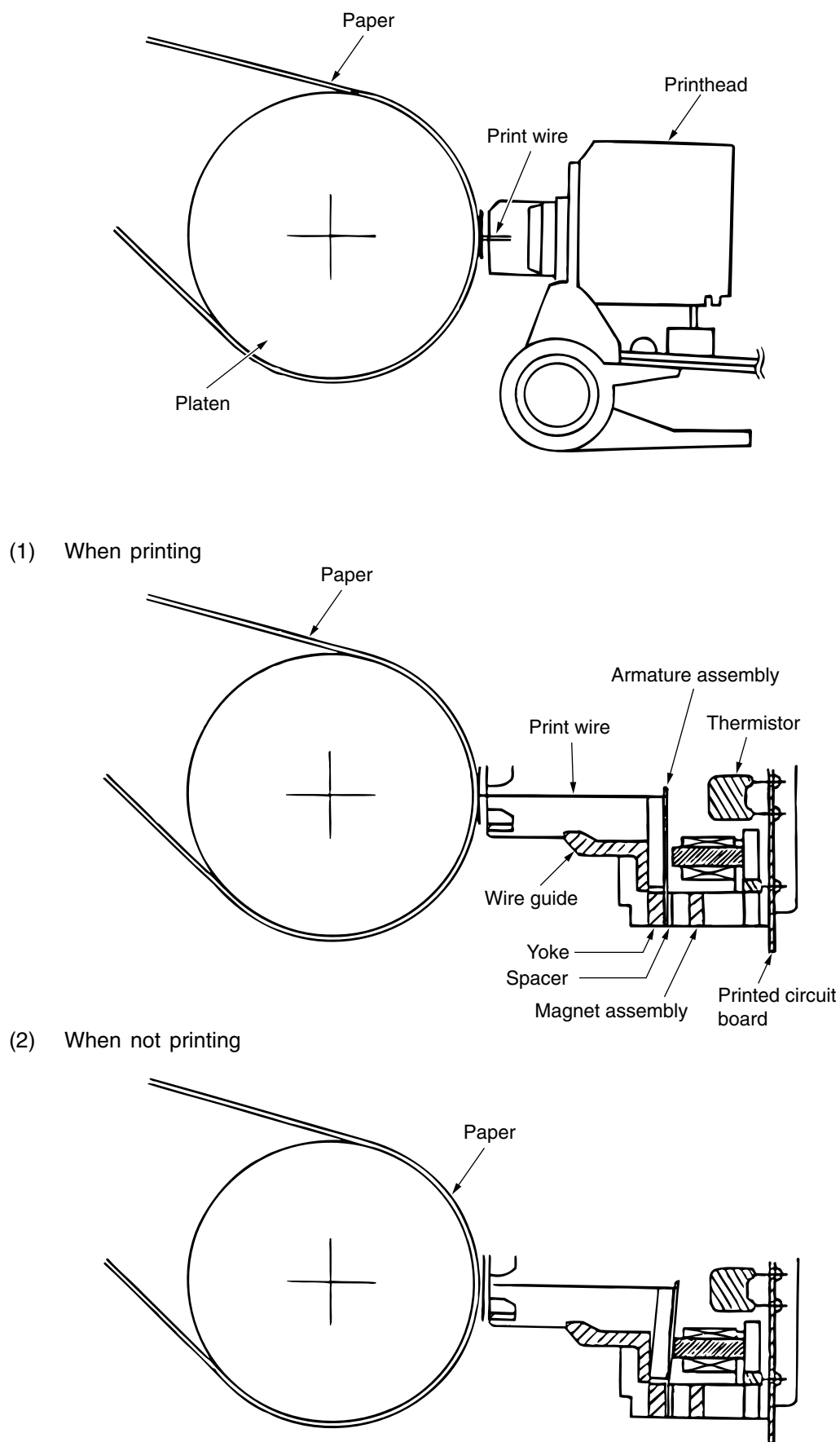


Figure 2-3

2.2.2 Spacing operation (See Figure 2-4.)

The spacing mechanism consists of a carriage shaft mounted in parallel with the platen, and a carriage frame that moves along the shaft. It is driven by a DC motor mounted on the bottom of the carriage frame. Items included in the spacing mechanism are as follows:

- (a) DC motor with motor gear
- (b) Carriage frame (stationary yoke and motor pc board included)
- (c) Carriage shaft
- (d) Space rack
- (e) Sensor
- (f) Encoder disk

(1) Spacing operation

The carriage frame, on which the printhead and space motor are mounted, moves along the carriage shaft in parallel with the platen. When the spacing motor rotates counterclockwise, the driving force is transmitted to the motor gear. As the motor gear rotates, the carriage moves from left to right.

Mechanically, it is designed in such a way that for every revolution of the DC motor, the carriage frame moves 0.8 inch (20.32mm).

At the same time the encoder disk rotates together with the motor and passes the sensor. The position of the carriage frame can be determined by counting the interrupts detected by the sensor.

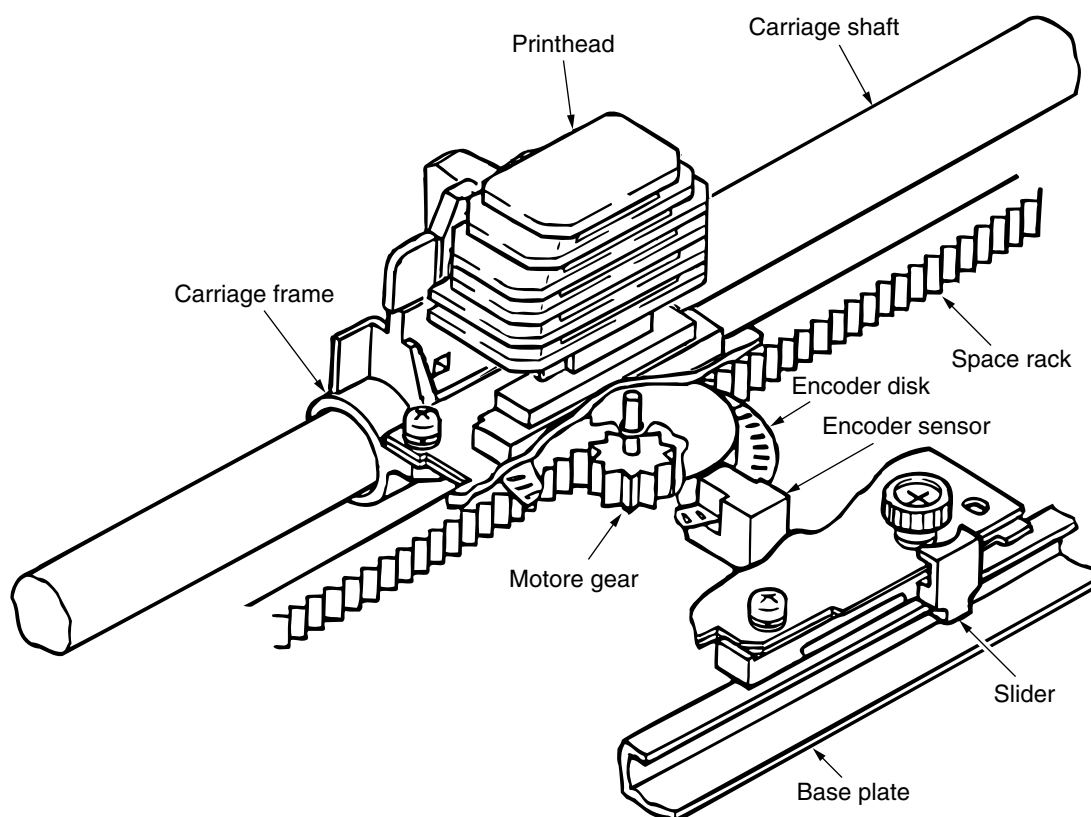


Figure 2-4

2.2.3 Head gap adjustment mechanism (See Figure 2-5.)

This mechanism moves an adjusting lever back and forth to tilt the carriage frame, creating an appropriate gap between the printhead and the platen.

An adjusting screw, which is connected to the adjusting gear, is rotated by moving the adjusting lever. Eventually the carriage changes its angle relative to the carriage axis.

The printhead, which is attached at the right angle to the opposite side of the adjusting screw on the carriage frame, will move away from or come closer to the platen as the tilt changes.

When the adjusting lever is set to position ③, the contact which is attached to the rear side of the carriage cover will come into contact with the spacing motor pc board. The printer will then reduce the printing speed automatically to ensure that the printing pressure is maintained for multipart paper.

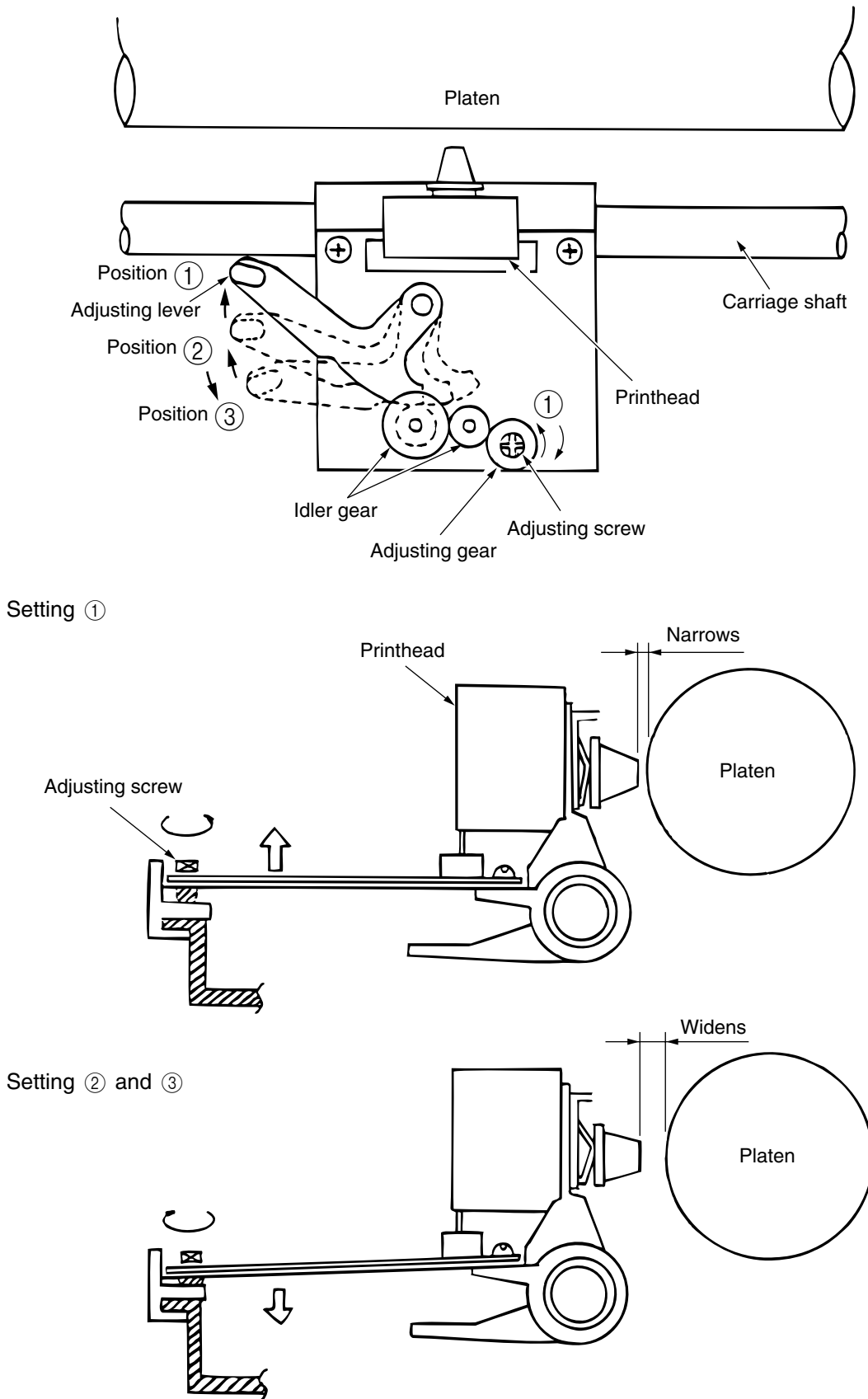


Figure 2-5

2.2.4 Ribbon drive operation (See Figure 2-6.)

The ribbon drive mechanism feeds the ribbon in synchronization with the spacing operation, and the driving force is obtained from the spacing motor.

Items of the ribbon drive mechanism are as follows:

- (a) Ribbon drive gear assembly
- (b) Ribbon gear (space motor)
- (c) Ribbon cartridge

(1) Ribbon cartridge

An endless ribbon with a one way feed is used. Ink is supplied from an ink tank, which is built into the ribbon cartridge.

(2) Drive operation

When the space motor is activated, the ribbon gear on the spacing motor shaft rotates. The rotation is transmitted via a combination of gear from the ribbon drive gear assembly to the drive gear in the ribbon cartridge, thus feeding the ribbon.

Although the ribbon moves in the reverse direction for bi-directional printing, the gears in the ribbon drive gear assembly maintain the same feed direction of the ribbon by switching the rotation a direction of the gears.

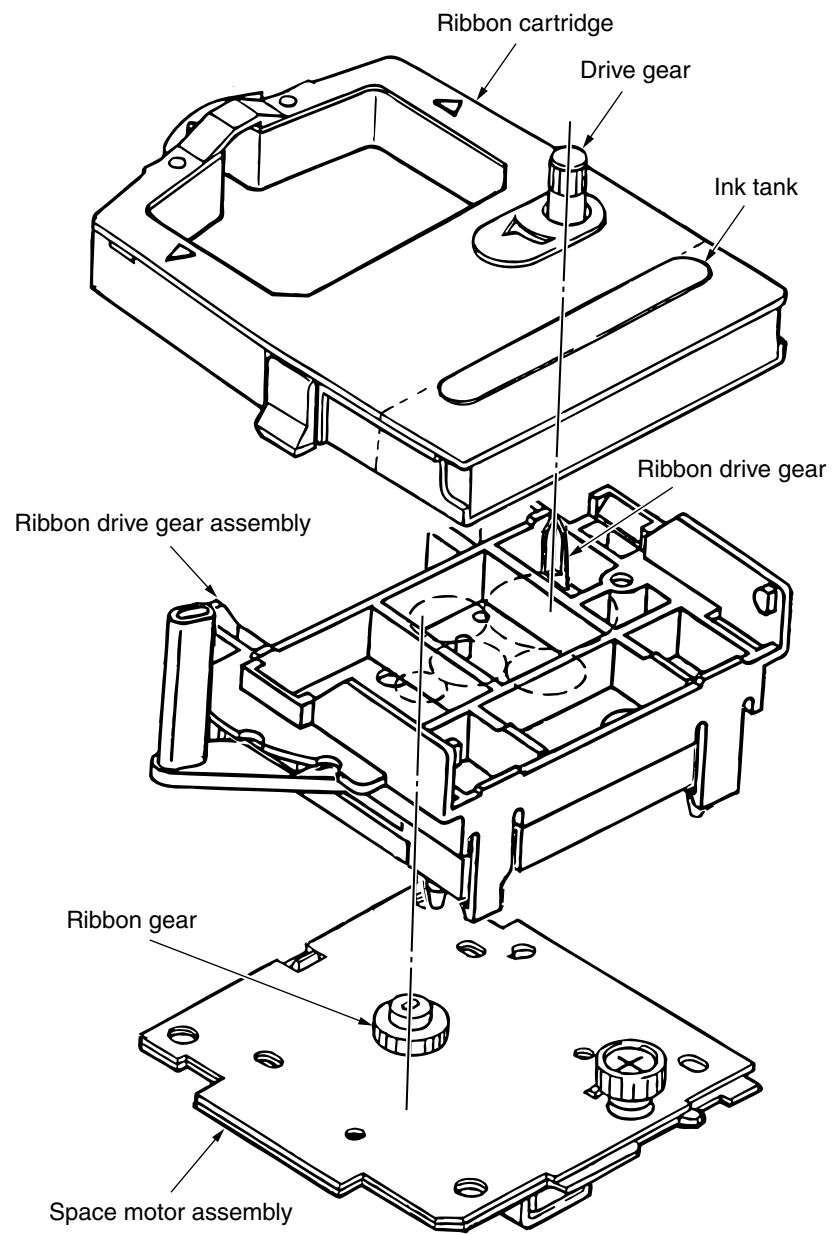


Figure 2-6

2.2.5 Paper feed operation

Feeding of the paper is performed by turning the platen and the pin tractor, which is driven by the LF pulse motor.

Item of the paper feed mechanism are as follows:

- (a) Pulse motor with gears
- (b) Decelerating gear
- (c) Platen
- (d) Tractor feed unit
- (e) Pressure roller

(1) Cut-sheet feed operation (See Figure 2-7.)

The pulse motor used for the paper feed mechanism is mounted on the left of the frame, and the rotation of the motor is transmitted through decelerating gears (idler gear, platen gear) to the platen. When using cut-sheet paper, the release lever must be in the closed position to grab the paper, while disengaging the push tractor.

Mechanically, it is designed in such a way that if the stepping motor rotates 48 steps (360 °), the paper advances 0.17 inch (4.23mm).

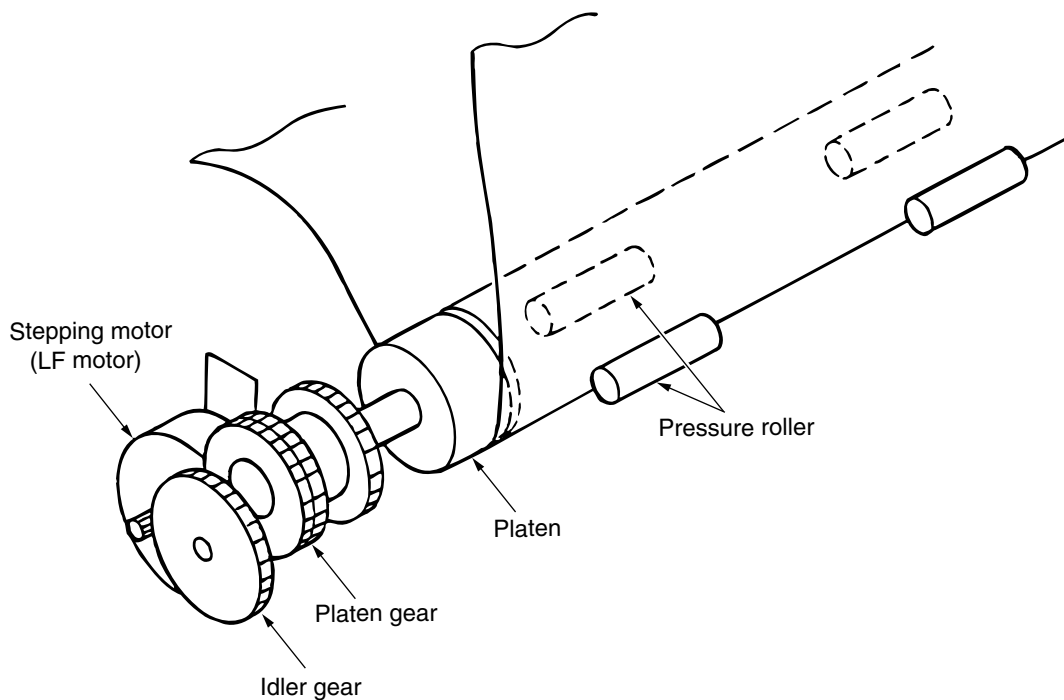


Figure 2-7

(2) Continuous paper feed operation (See Figure 2-8.)

The force transmitted to the platen, rotates the tractor gear through platen gear, the idler gear and the change gear. The rotation of the tractor gear makes the pin tractor belt rotate through a sheet feeder shaft, feeding the continuous paper.

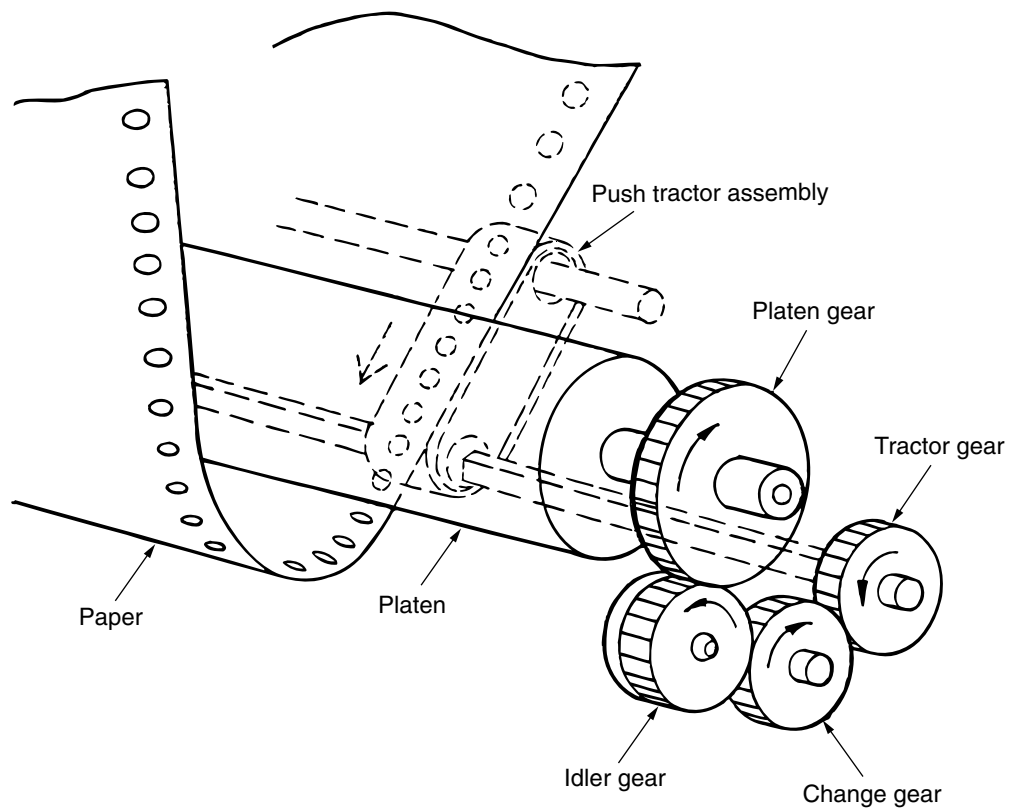


Figure 2-8 Paper feed operation of continuous paper

(3) Cut-sheet and continuous sheet switching mechanism (See Figure 2-9.)

Cut-sheet and continuous sheet are selected by the release lever on the right of the printer mechanism. When the release lever is pushed back, the change gear is moved outward as shown in the direction of the arrow. As the power transmission from the the idler gear to tractor gear is removed, the pin tractor is kept still.

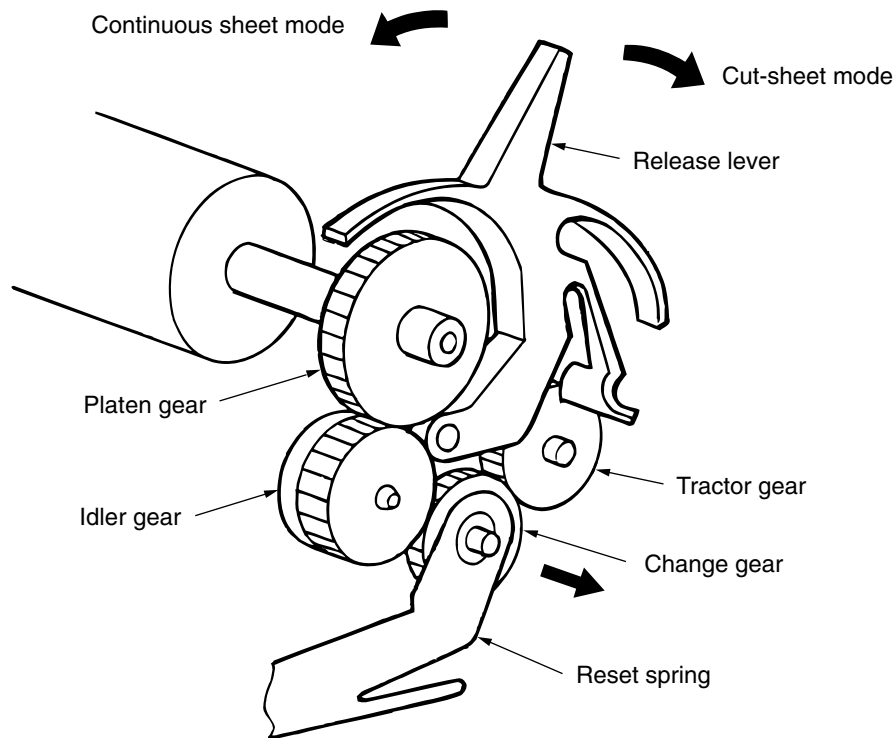


Figure 2-9

In other words, cut-sheets are fed by the rotation of the platen, but continuous sheets are not fed. When the release lever is moved forward, the change gear moves in the opposite direction to that of the arrow because the change gear is pressed against the reset spring. The rotation of the idler gear is then transmitted to the tractor gear and continuous sheets can be fed.

(4) Pull tractor mechanism (option) (See Figure 2-10.)

Bottom feed of continuous sheets is possible only when an optional pull tractor unit is installed.

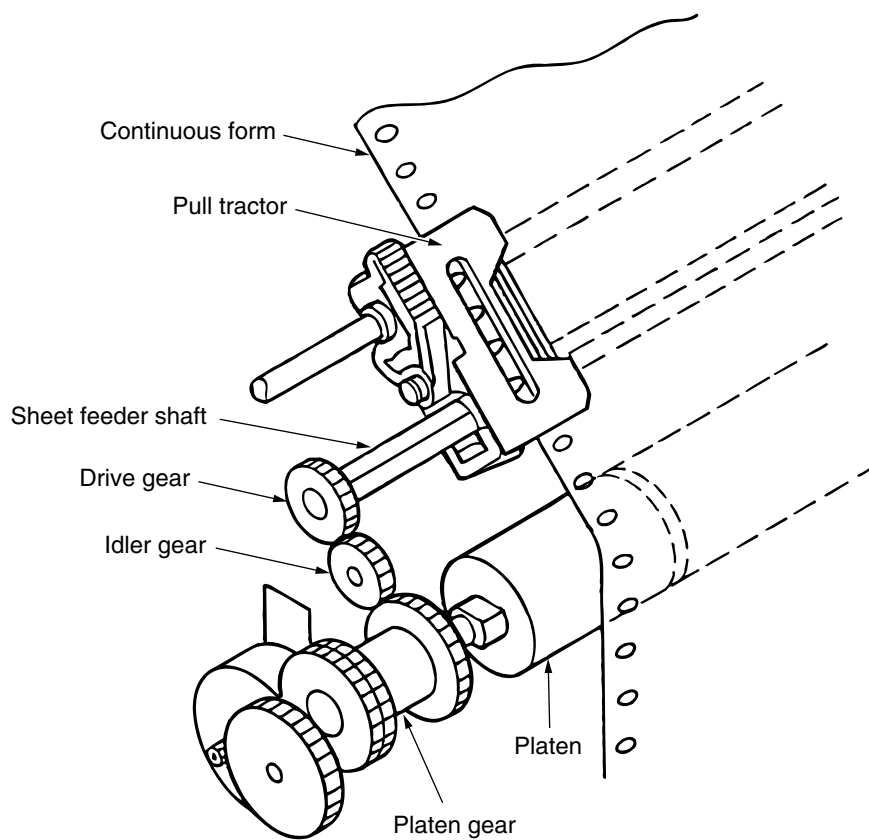


Figure 2-10

The rotation of the platen is transmitted to the idler gear of the pull tractor unit through the platen gear at the left end of the platen. The rotation of the idler gear is transmitted to the drive gear, and continuous sheet forms are fed by the pull tractor being rotated through the sheet feeder shaft.

(5) Push and pull tractor mechanism (option) (See Figure 2-11.)

This mechanism consists of an optional pull tractor and a standard push tractor mechanism.

This mechanism can perform forward and reverse feed by setting continuous sheets to the push tractor and pull tractor.

The rotation of the platen is transmitted to the push tractor and the pull tractor. Sheets are fed by these two tractors at the same time.

To remove slack from the sheets, set the sheets according to the following procedure when using the push and pull tractors.

- ① Set the release lever to the continuous sheet side (setting the sheets to the push tractor to feed).
- ② Set the paper, which is fed in front of the platen, to the pull tractor.
- ③ Set the release lever to the cut-sheet side and feed paper using the platen knob.
- ④ If paper slack is removed, set the release lever to the continuous sheet side.

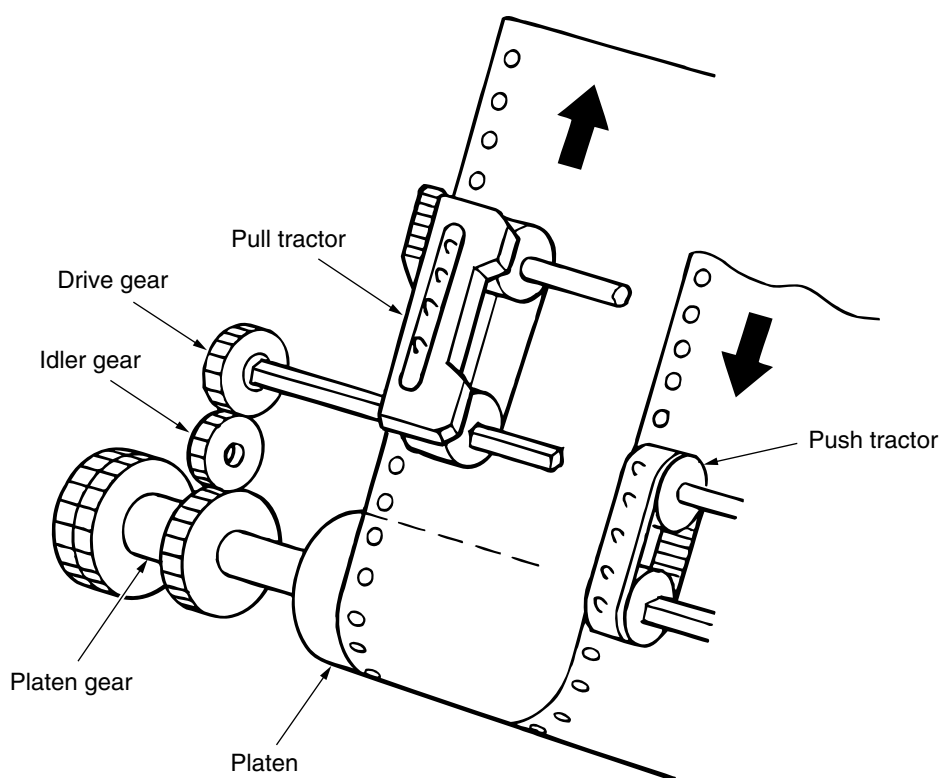


Figure 2-11

(6) Paper clamp mechanism (See Figure 2-12.)

When the release lever is pushed toward the open position, the release link rotates counterclockwise. This is because the protruding portion of the release lever escapes from the slot of the release lever; and the release shaft, which is engaged with this, rotates counterclockwise at the same time. A clearance is created between the pressure roller and the platen through which sheets can be inserted.

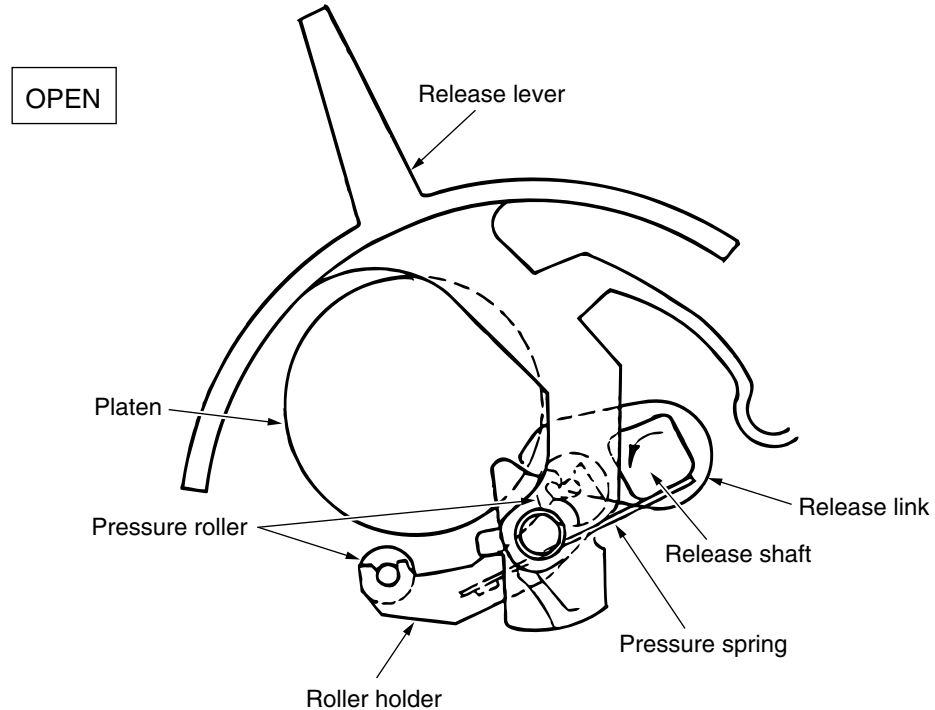


Figure 2-12 (a)

Conversely, if the release lever is locked in a closed position, the release link rotates clockwise.

This is because the release link is pushed up by the protruding portion of the release lever and the release shaft, which is engaged with this, rotates clockwise at the time. The pressure roller is pressed against the platen by the pressure spring welded to the release shaft, thus enabling feeding.

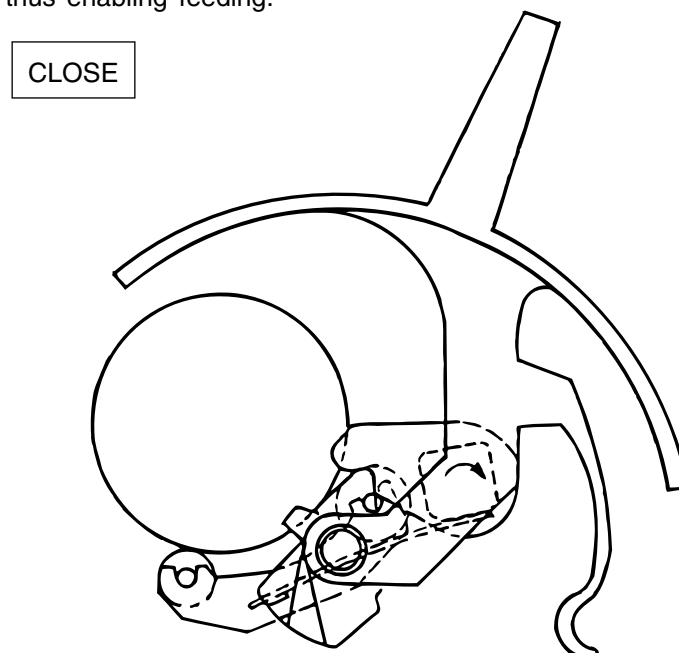


Figure 2-12 (b)

2.2.6 Paper end detection mechanism (See Figure 2-13.)

(1) Paper end for rear paper feed

When a sheet is inserted, tip A of paper end lever B is prevented, by the paper, from dropping into the slot of the paper shoot. The sensor lever is pushed up by pressure[Ⓐ] and the paper end sensor is thus turned on. If the paper is removed, tip A of paper end lever B drops into the slot of the paper shoot. At the same time the rear part of the sensor lever intercepts the sensor, turns it off, and detects a paper end. The paper end is detected with about 1 inch (25.4 mm) of paper remaining from the print position.

(2) Paper end for bottom paper feed

When a sheet is inserted, tip B of the paper end lever B is prevented from dropping into the slot of the bottom paper guide by the sheet, and the sensor lever is pushed up by pressure[Ⓑ] and the paper end sensor comes on. If the paper is removed, tip part B of the paper end lever B drops into the slot of the bottom paper guide. At the same time the rear part of the sensor lever intercepts the sensor, it turns off and detects a paper end condition. The paper end is detected with about 1 inch (25.4 mm) of paper remaining from the print position.

(3) Cut-sheet end

When a sheet is inserted, the paper prevents the tip of the paper end lever from dropping into the slot of the platen. The sensor lever is pushed up by pressure[Ⓒ], and the sensor is turned on.

If the sheet is removed, the paper end lever drops into the slot of the platen, the rear part intercepts the sensor at the same time, turns it off and detects a paper end. The paper end is detected with about 1 inch (25.4 mm) of the sheet remaining from the print position.

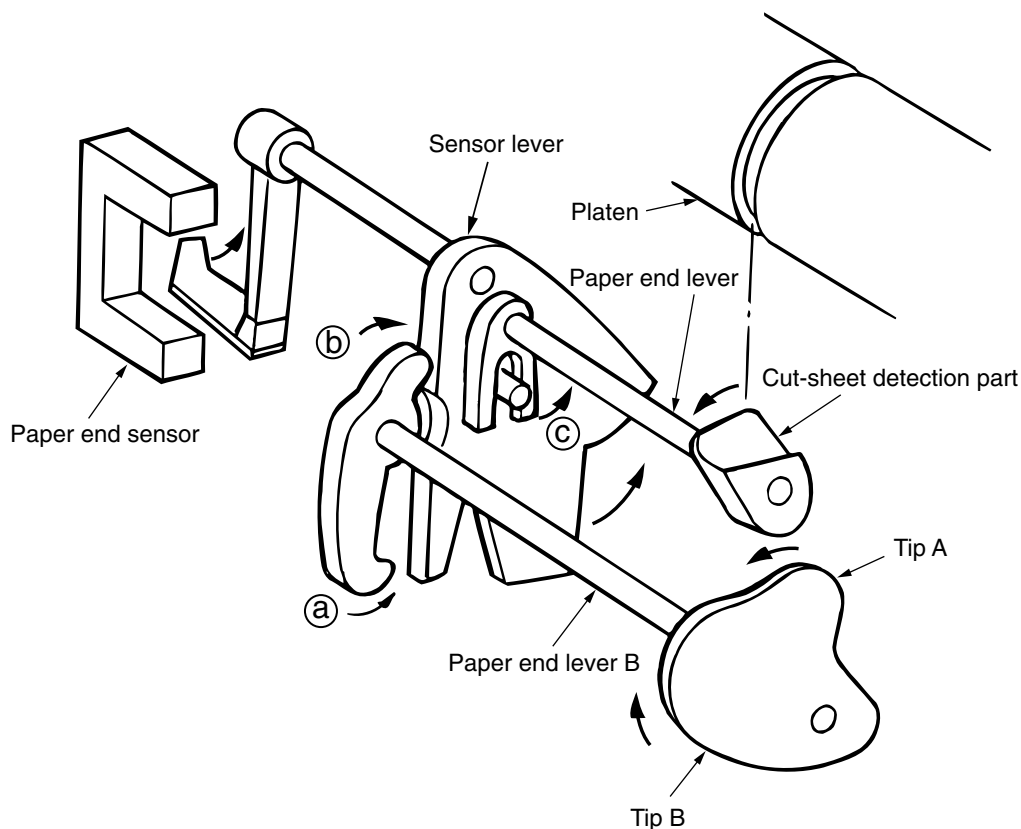


Figure 2-13

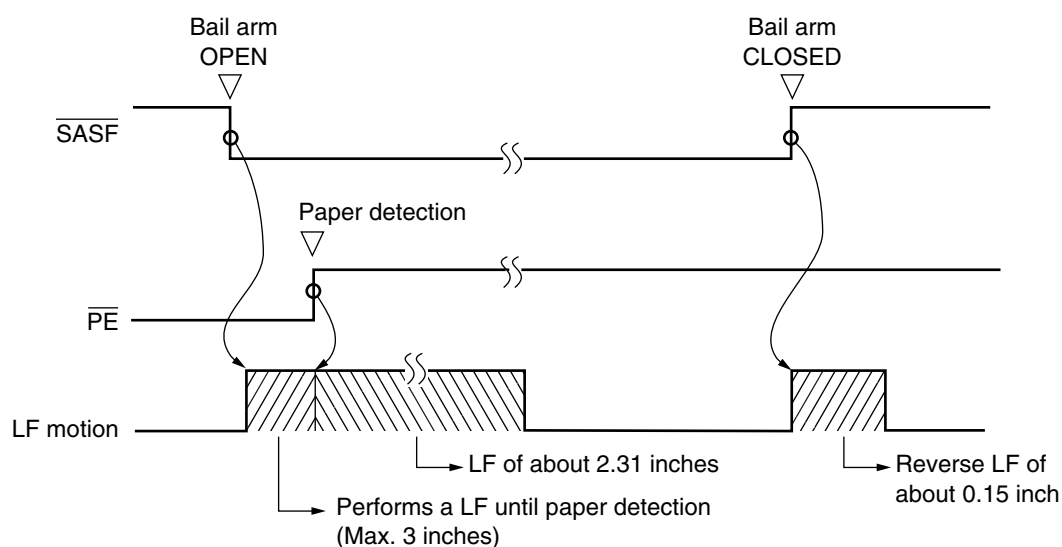
2.2.7 Semi-automatic sheet feed (SASF) operation (See Figure 2-14.)

This function sets the print start position of the paper automatically when using cut-sheet and continuous sheet paper.

The procedures of operation are as follows:

(1) When using cut-sheets (SASF)

- ① Set the release lever to the cut-sheet side (rear side).
- ② Insert paper from behind the platen.
- ③ Pull the bail arm forward to set it to the open state, causing the SASF switch to be turned on.
- ④ LF operation is started and paper will be fed into the printer.
- ⑤ About 2.31 inches of a new sheet are fed after paper detection.
- ⑥ If the bail arm is returned to the original position, a reverse LF of about 0.15 inches is performed.



When the bail arm is set open, the LF motor is driven to feed 3 inches of paper. When the LF motor drive has finished this, and if a sheet has not been fed, the SASF motion becomes invalid and is handled as an ordinary paper end.

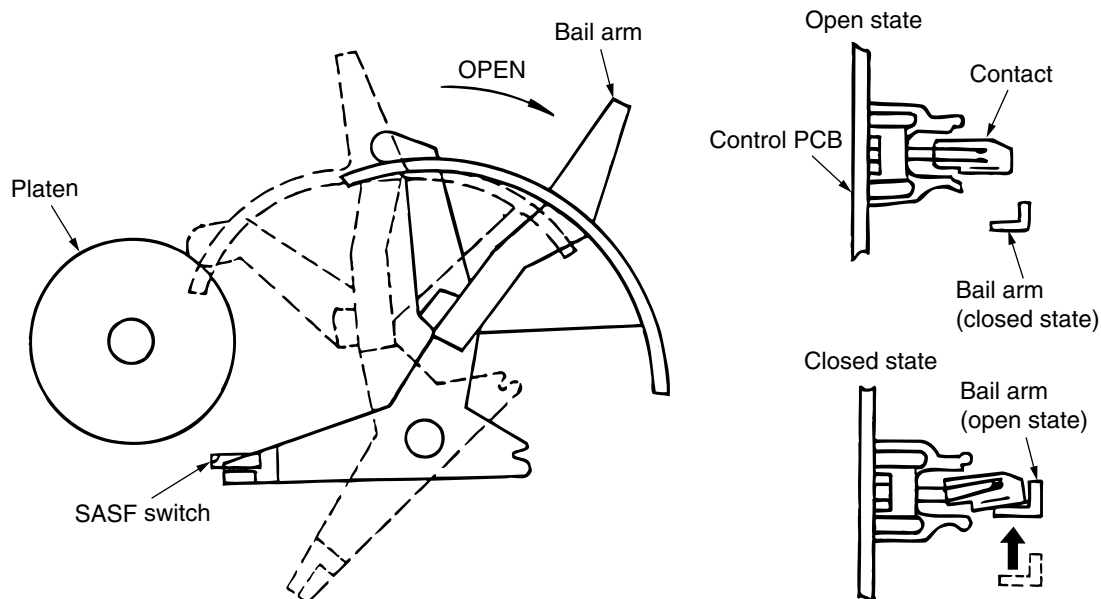
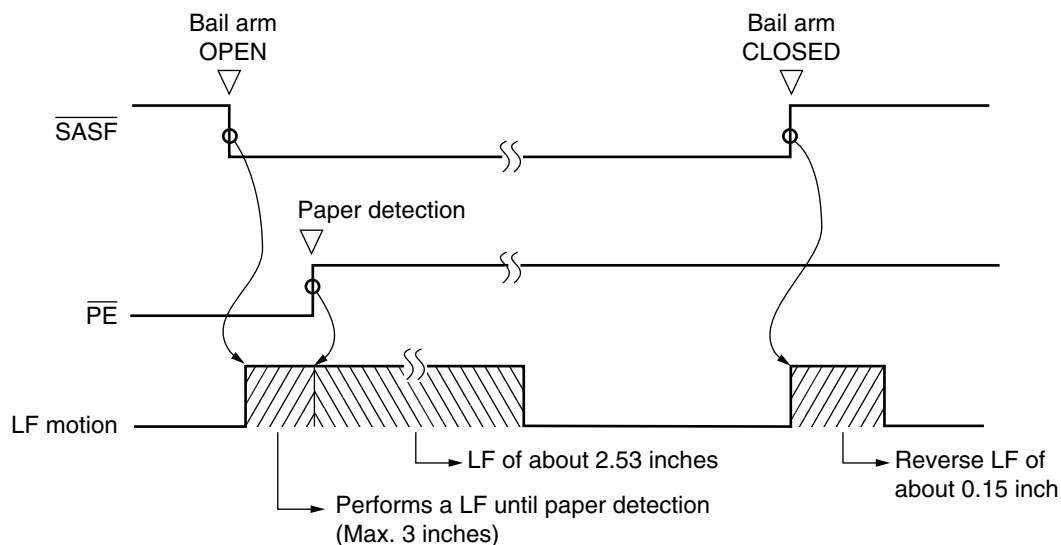


Figure 2-14

(2) When using continuous sheets (rear feed) (auto load)

- ① Set the release lever to the continuous sheet side.
- ② Insert the paper in the push tractor.
- ③ Push the bail arm forward to the open state, turning on the SASF switch.
- ④ The LF action is started, and sheets will be fed into the printer.
- ⑤ About 2.53 inches of the sheet is then fed after paper detection.
- ⑥ When the bail arm is returned to the original position, a reverse LF of about 0.15 inch is performed. The position is about one inch from the top of the sheet for the print start line.



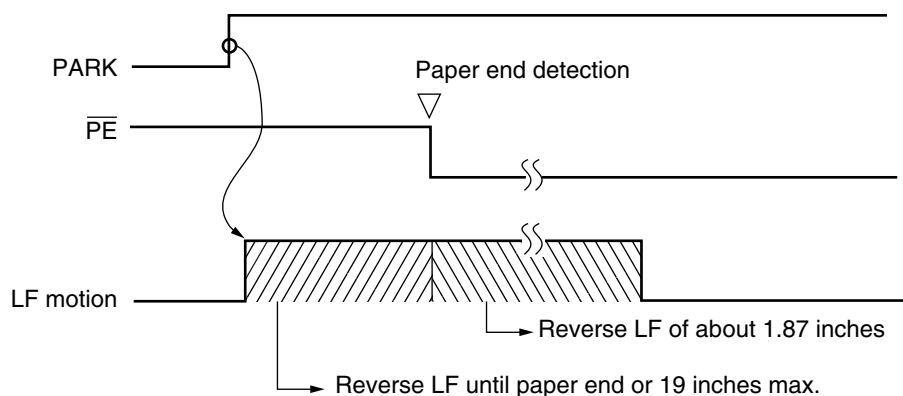
When the bail arm is set to open, the LF motor is driven to feed 3 inches of paper. When the LF motor drive has finished this, and if a sheet has not been fed, the auto load action becomes invalid and is handled as an ordinary paper end.

2.2.8 Reversing continuous sheets

Continuous sheets which have been inserted can be reversed automatically by using the park button on the operation panel.

Its operation is as follows:

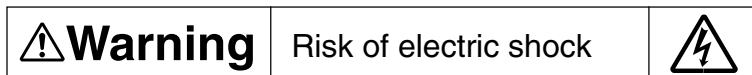
- ① Press the park button on the operation panel.
- ② Reverse LF is started and the sheet is fed reversely until paper end or 19 inches maximum is detected.
- ③ About 1.87 inches of the sheet is fed reversely after paper end, then the top of the sheet stops while still on the push tractor.



3. ASSEMBLY/DISASSEMBLY

3.1 Precautions for Parts Replacement

- (1) Before making the assembly and disassembly, be sure to remove the AC cable and interface cable.
- (a) After turning OFF the AC power switch, pull out the AC input plug of the AC cable from the AC receptacle and then the AC cable from the inlet on the printer side.

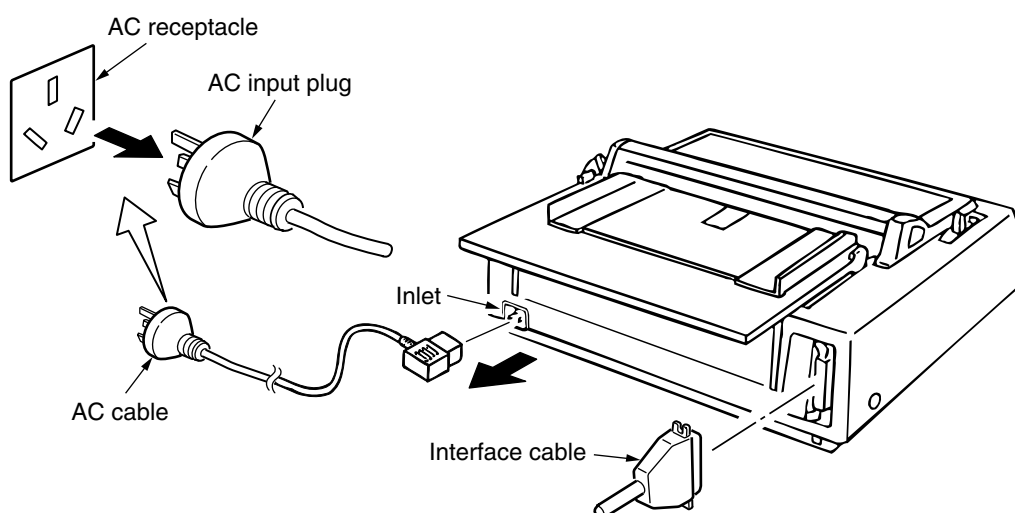


There is a risk of electric shock during replacement of the power supply.

Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cable is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

- (b) When the AC cable is connected again, first connect the cable to the inlet on the printer side and then the AC input plug to the AC receptacle.



- (2) Do not disassemble the printer as long as it is in good operating condition.
- (3) Be careful not to remove parts unless necessary. Disassembly should be kept to the necessary minimum.
- (4) Use only the specified maintenance tools.
- (5) Disassemble the printer in the specified order, otherwise parts may be damaged.
- (6) In the course of disassembly, it may be a good idea to keep the removed small parts such as screws and washers by temporarily attaching them to their original places so as not to lose them.
- (7) ICs such as the microprocessor, ROM, and RAM can easily be damaged by static electricity. Do not wear gloves that are apt to produce static electricity when handling printed-circuit boards.
- (8) Do not place the printed-circuit boards directly on the printer or the floor.

3.2 Maintenance Tools

The tools required in replacing printed circuit boards and other parts in the field are shown in Table 3-1. Tools other than those mentioned below may be necessary for other maintenance procedures.

Table 3-1 Maintenance tools

No.	Maintenance tool	Quantity	Purpose of tool	Remarks
1	Screwdriver No. 1-200	1		
2	Phillips screwdriver No. 2-200	1	3-to 5-mm screws	
3	Screwdriver No. 3-100	1		
4	Cutters No.5 H	1		
5	Round pliers No.1	1		
6	Thickness gauge set	1	For head gap adjustment	include Final Specs.
7	Volt-ohm-milliammeter	1		

3.3 Disassembly/Reassembly procedure

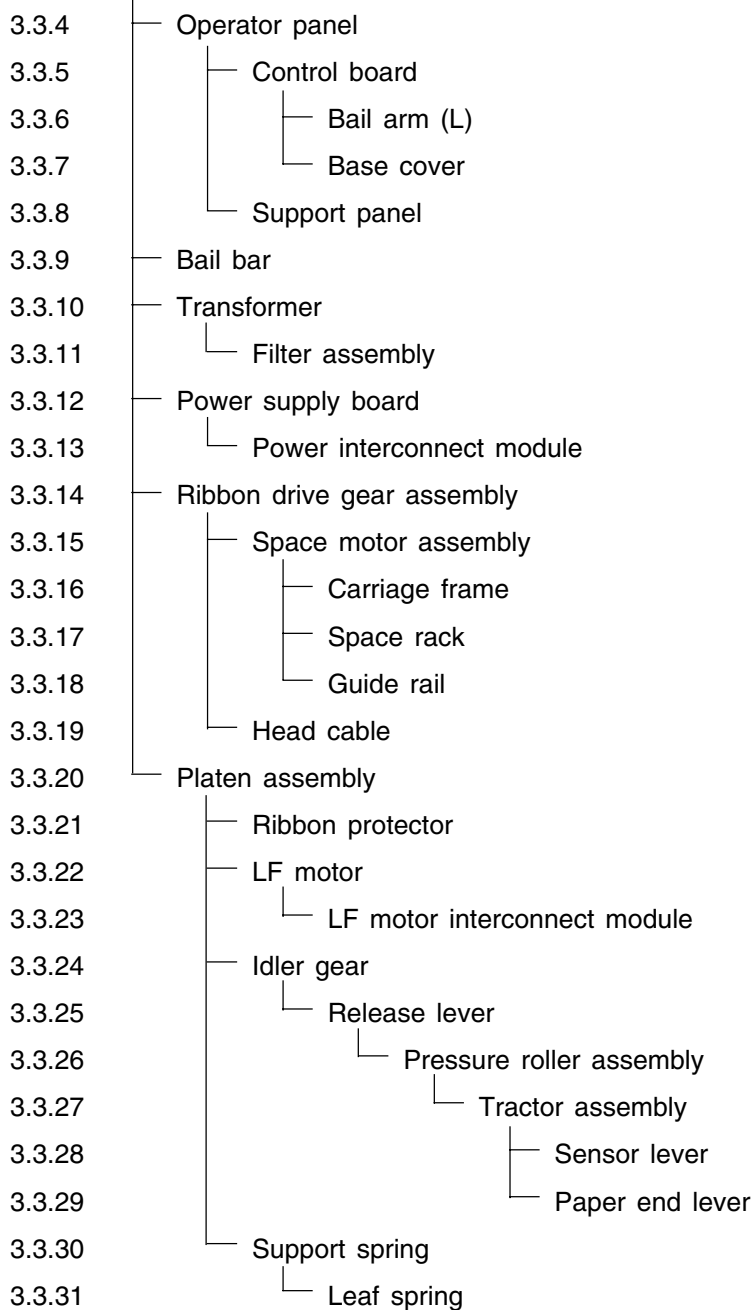
This manual explains the methods for detaching and attaching the assemblies shown in the following disassembly diagrams. The procedures explained apply to detaching the assemblies.

Reverse the procedures, when attaching the assemblies.

3.3.1 Ruler Guide

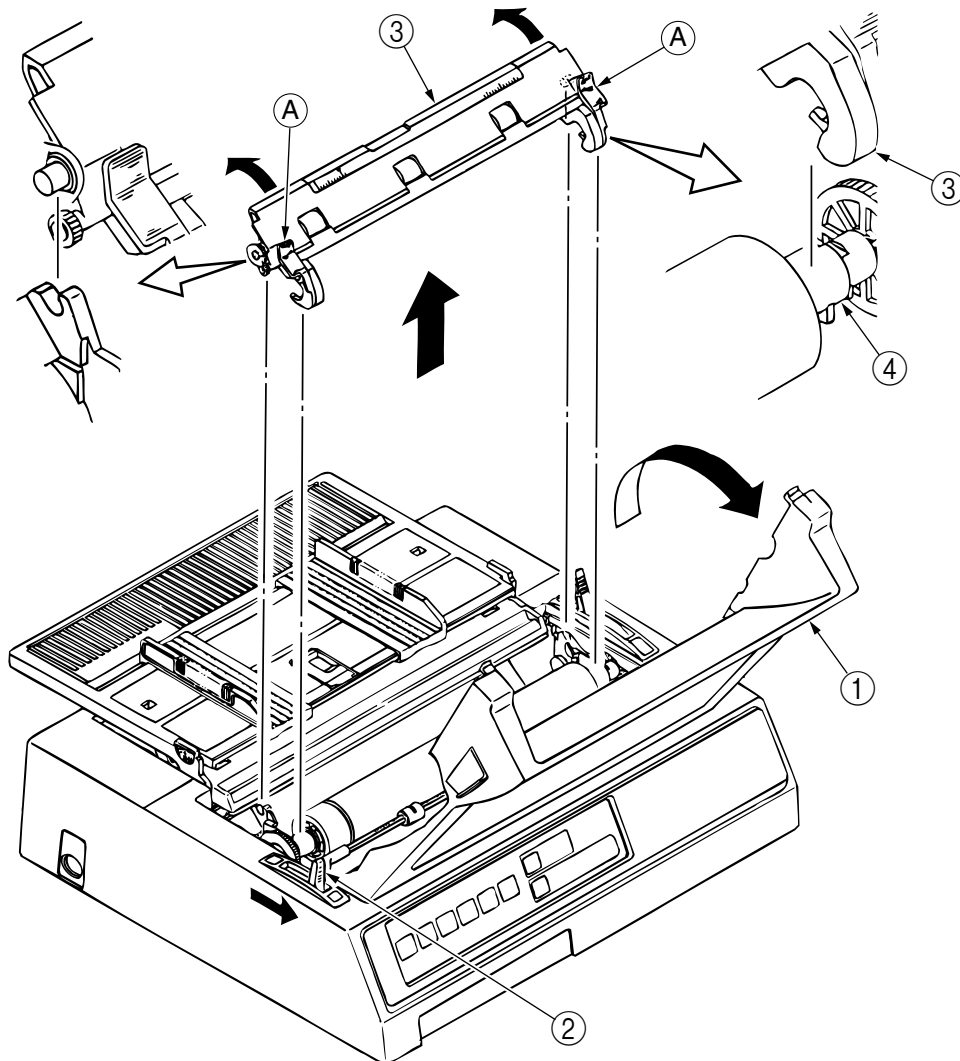
3.3.2 Printhead

3.3.3 Upper cover assembly



3.3.1 Ruler Guide

- (1) Open access cover ①.
- (2) Tilt bail lever ② forward.
- (3) Tilt ruler guide ③ backward by lock lever A to release it from the platen assembly shaft ④.

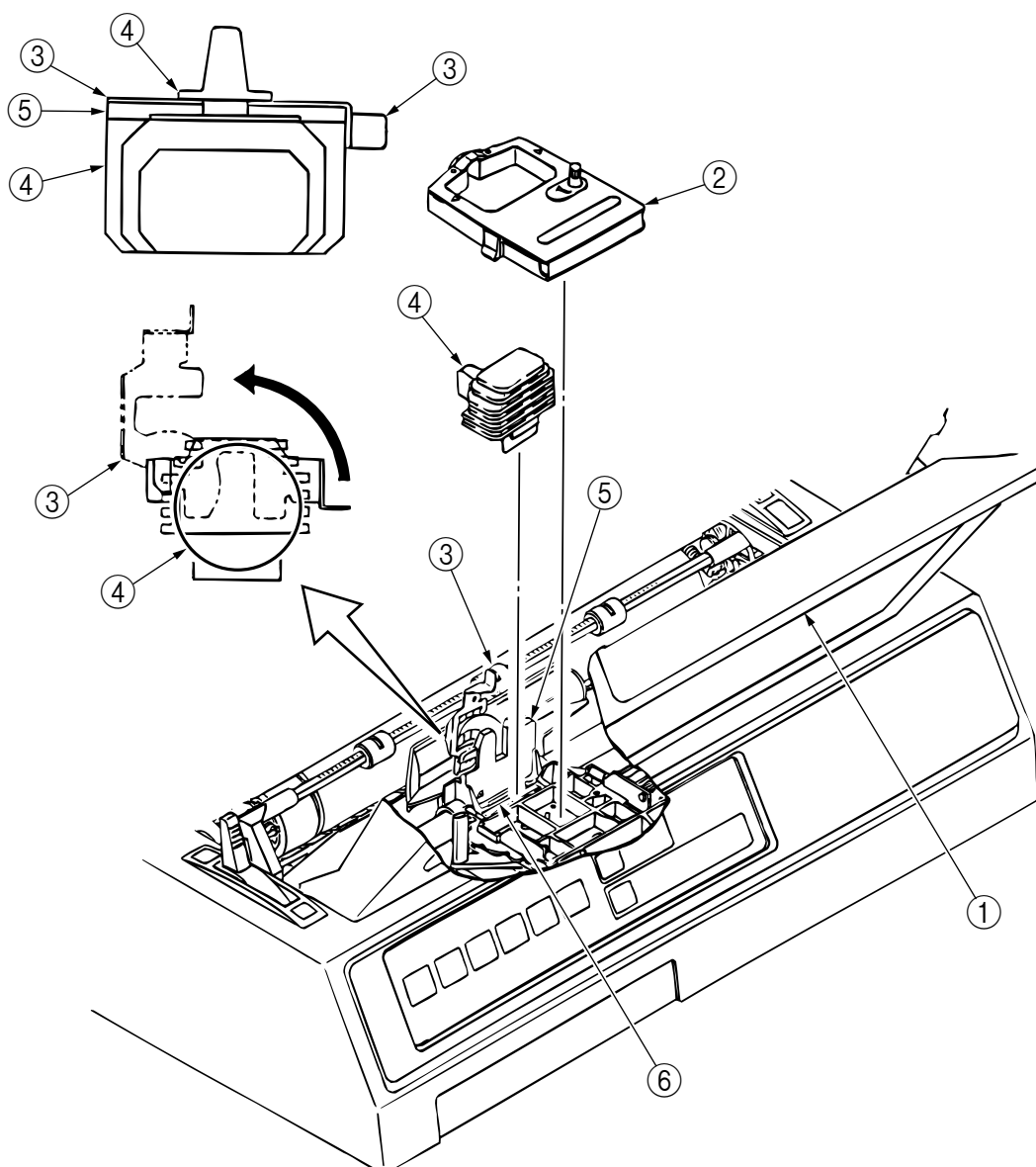


3.3.2 Printhead

- (1) Open the access cover ①.
- (2) Remove the ribbon cassette ②.
- (3) Lift the head clamp ③ 90° to the left to unlock the printhead ④.
- (4) Remove the printhead ④ from the carriage frame ⑤.

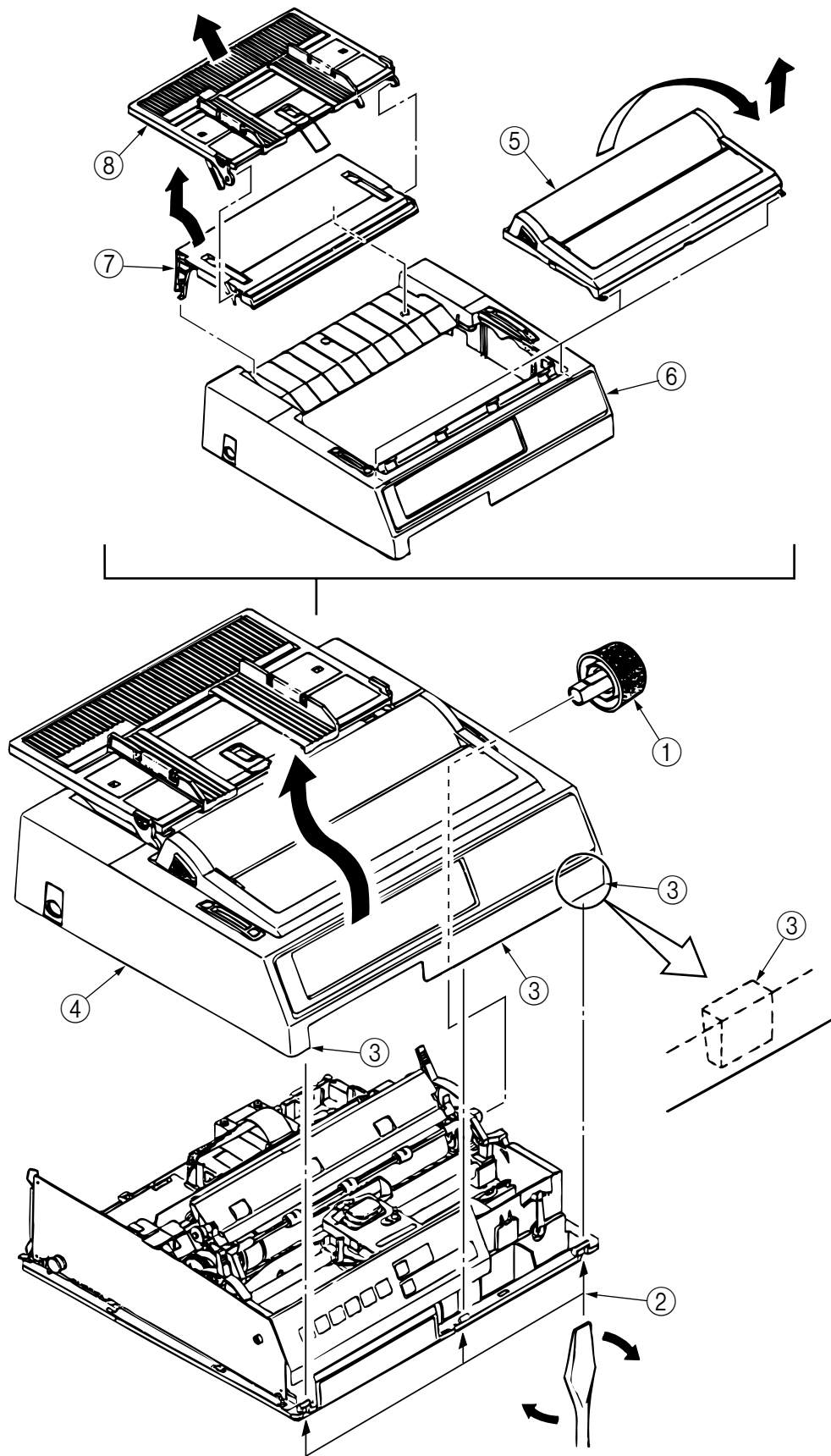
[Notes on installation]

1. Push the printhead ④ into the connector ⑥ while attaching it to the carriage frame ⑤.
2. Insert the head clamp ③ securely between the printhead ④ and the carriage frame ⑤.



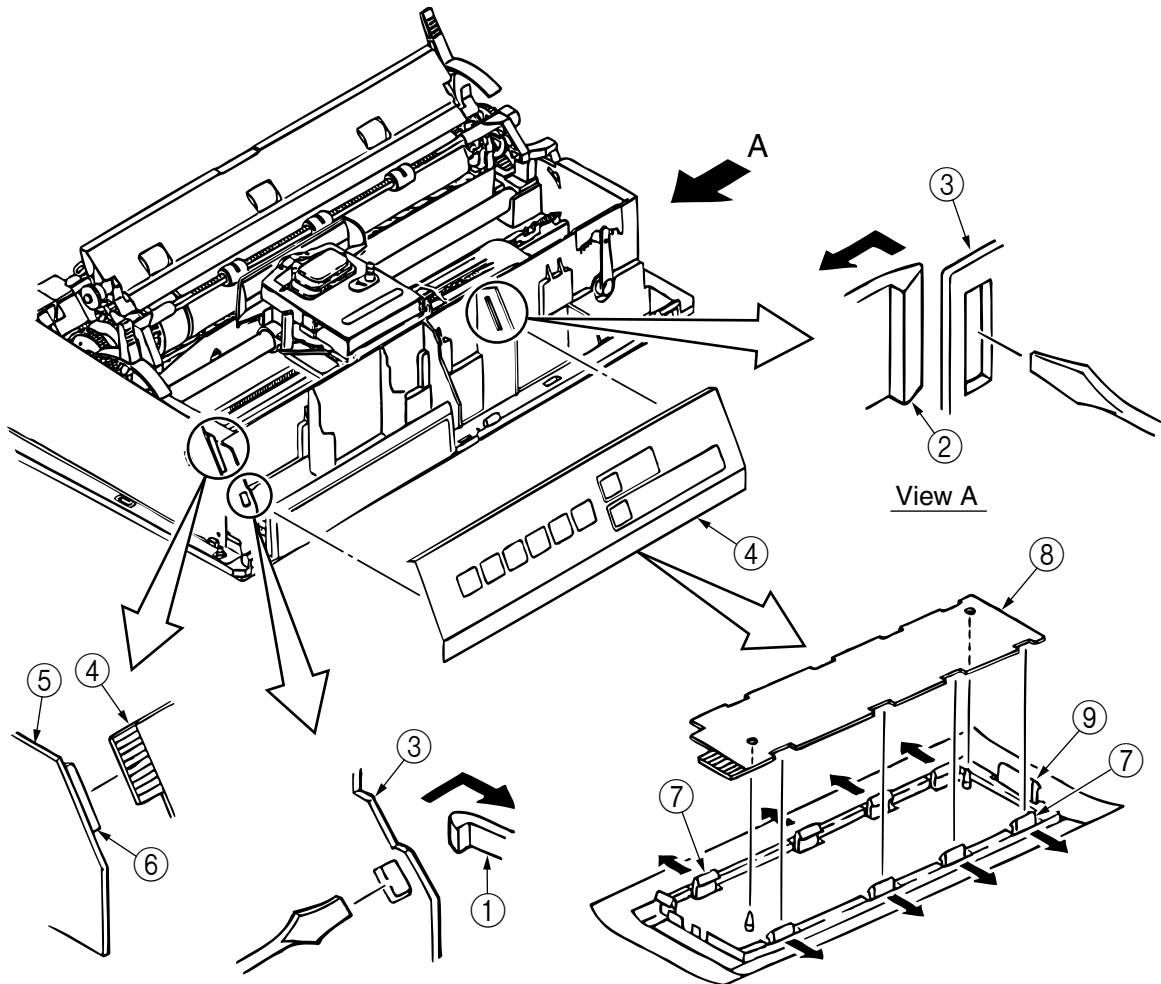
3.3.3 Upper cover assembly

- (1) Detach the platen knob ①.
- (2) Insert a flat-blade screwdriver through the three slots ② in the main frame and disengage the claw ③ of the upper cover.
- (3) Lift the front of the upper cover ④ and detach it by pushing backward and pulling up.
- (4) Open and take out the access cover ⑤ from the middle cover ⑥.
- (5) Detach the sheet separator ⑧ from the rear cover ⑦.
- (6) Detach the rear cover ⑦ from the middle cover ⑥.



3.3.4 Operator panel

- (1) Detach the control board. (See 3.3.5.)
- (2) Push the claws ① and ② inward and remove the operator panel ④ from the main frame ③.
- (3) Push the eight claws ⑦ outward and detach the operator panel circuit board ⑧ from the panel frame ⑨.

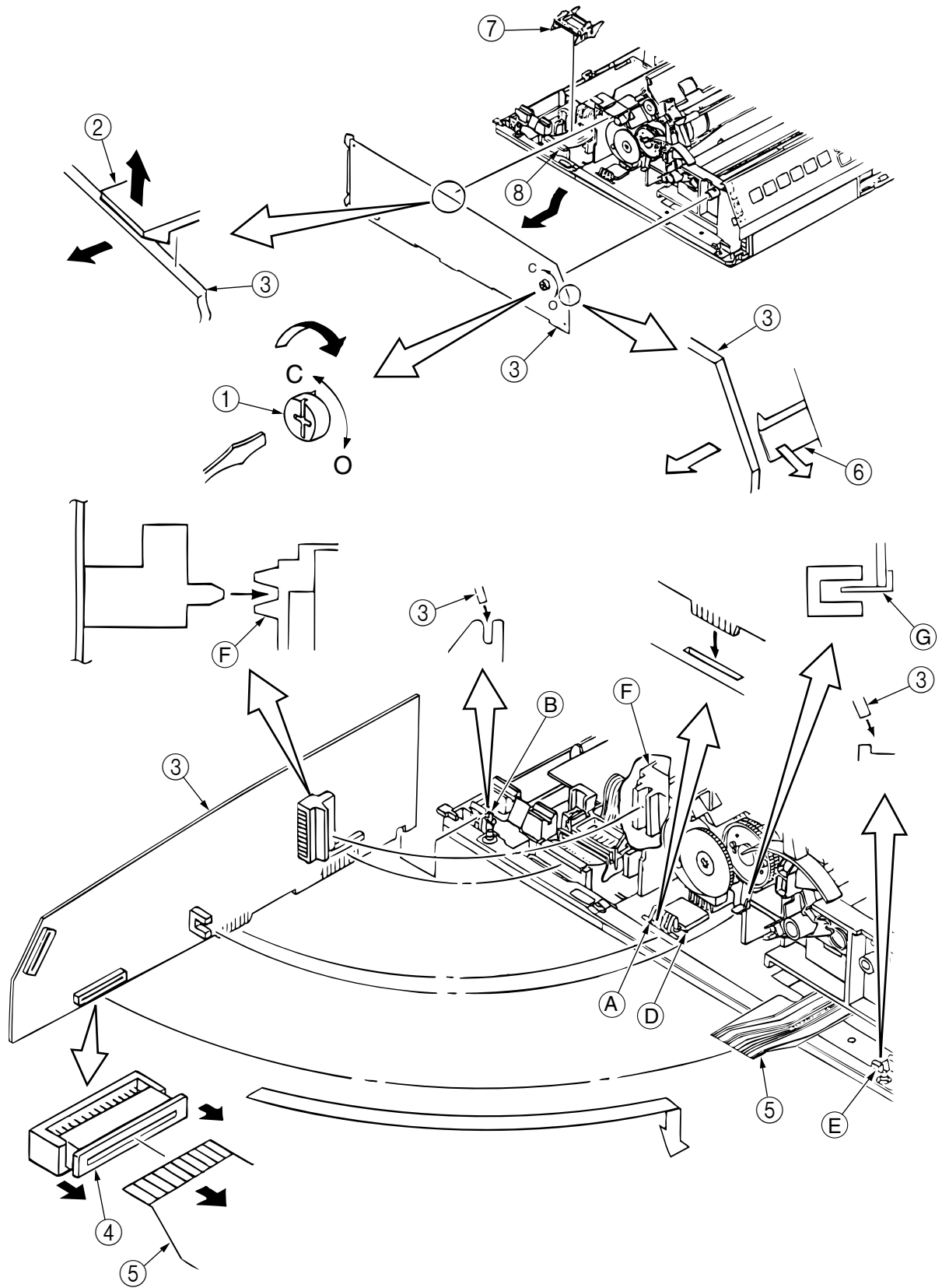


3.3.5 Control board

- (1) Detach the upper cover assembly. (See 3.3.3 step (3).)
- (2) Turn the locking post ① 90° clockwise to unlock it.
- (3) Push the board clamp ② upward.
- (3)' Lift the nail ⑥ of operator panel from and pull the control board ③ to the left.
- (4) Slant the control board ③ 45° and pull it out upward.
Detach the code clamp ⑦ and pull out the connector ⑧.
- (5) Detach the printhead cable ⑤ from the connector ④. Pull Black connector ④ away from the control board before pulling printhead cable out.

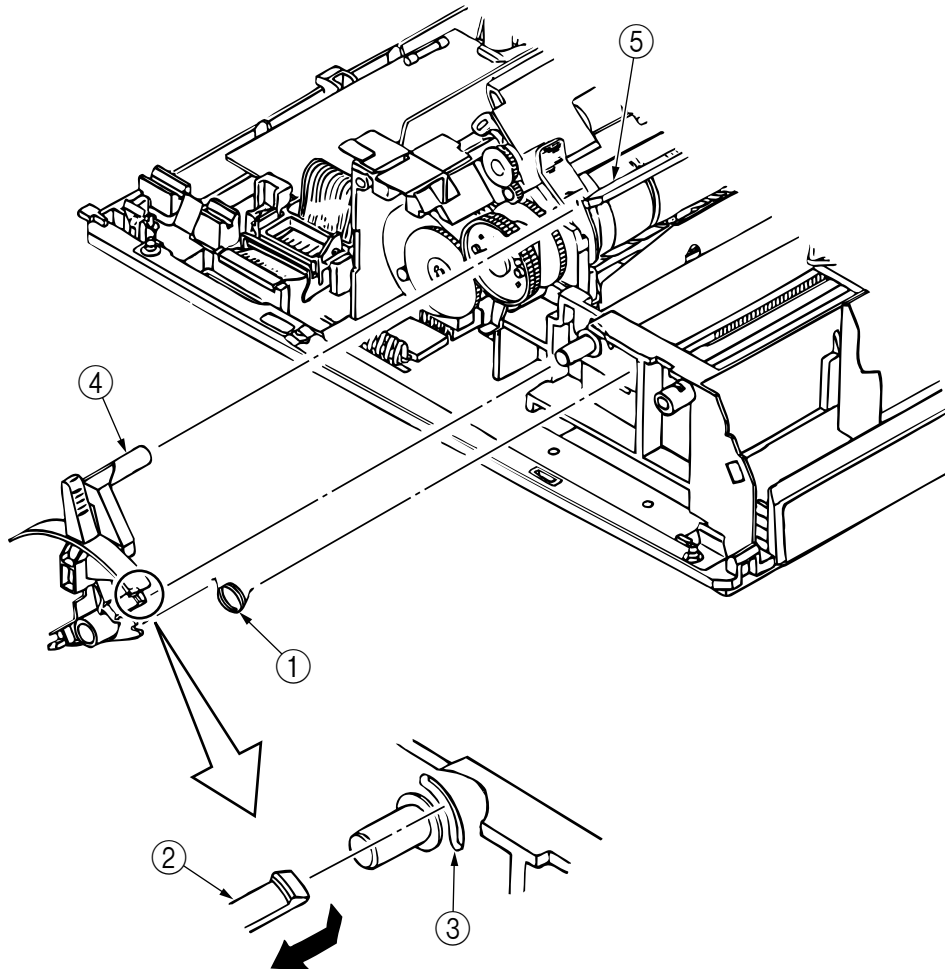
[Notes on installation]

1. Do not touch the exposed terminals (crimp terminalsⒶ) in the connector and control board ③.
Protect these terminals from dirt and dust.
2. Attach the board so that the following parts are securely connected. Guide Ⓑ , Power contact Ⓒ , Connection plate Ⓓ , Guide Ⓔ , Guide Ⓕ , Sensor Lever Ⓖ .
3. Install a piece of paper into the printer to prevent sensor lever Ⓖ to touch with the paper end sensor, and install the control board with the sensor lever Ⓖ pressed down.
4. Insert the head cable fully to the connector ④.



3.3.6 Bail arm (L)

- (1) Detach the control board. (See 3.3.5.)
- (2) Detach the bail arm spring (L) ① with pliers.
- (3) Push the claw ② outward and detach the bail arm (L) ④ by pulling it from the guide hole ③ in the main chassis (the arm is also detached from bail bar ⑤).

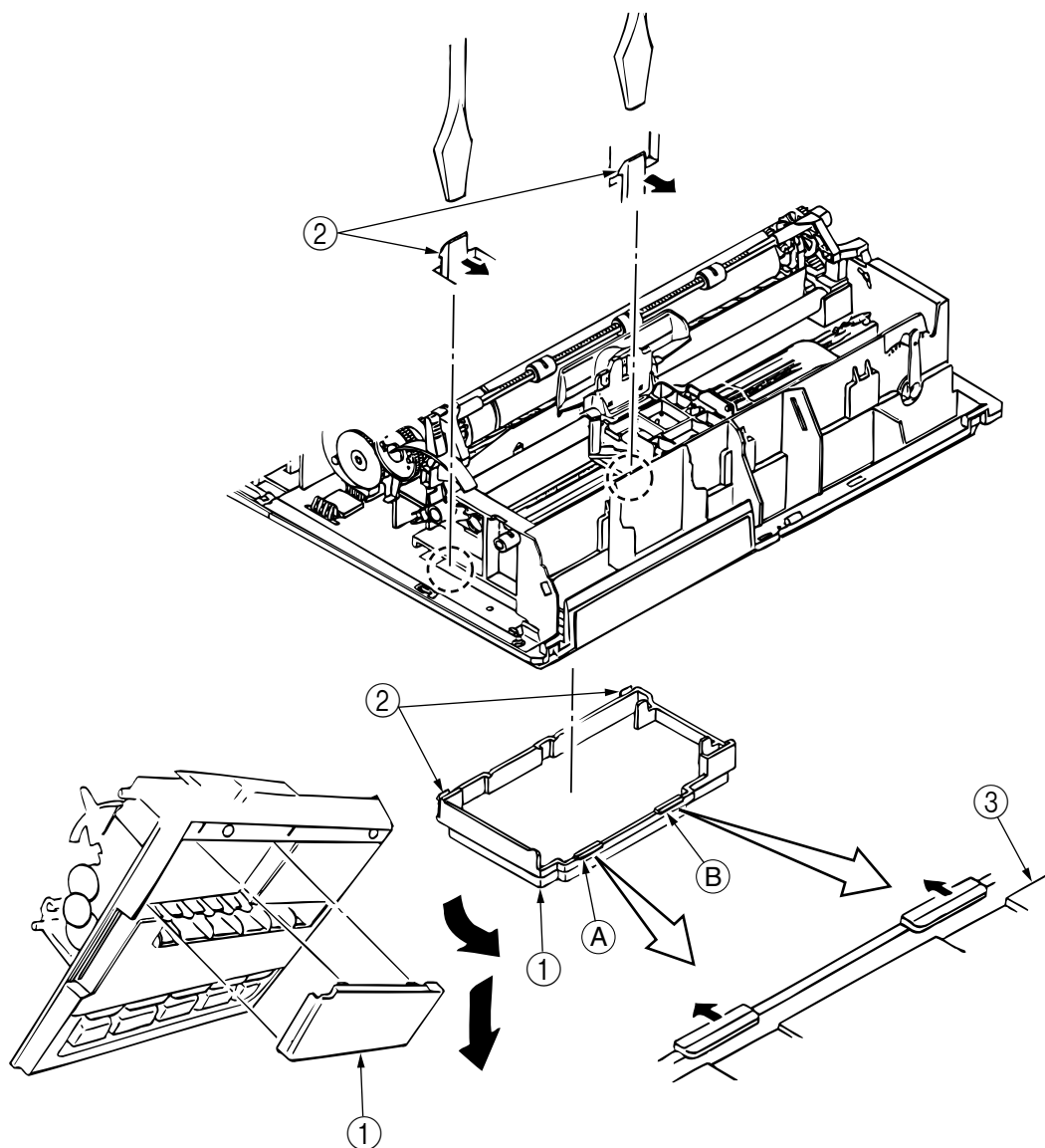


3.3.7 Base cover

- (1) Lift the main frame forward, so that you can see the back side of it.
- (2) Pull the two claws ② of the base cover ① forward to unlock it, then press the claws ② down to detach the base cover ①.

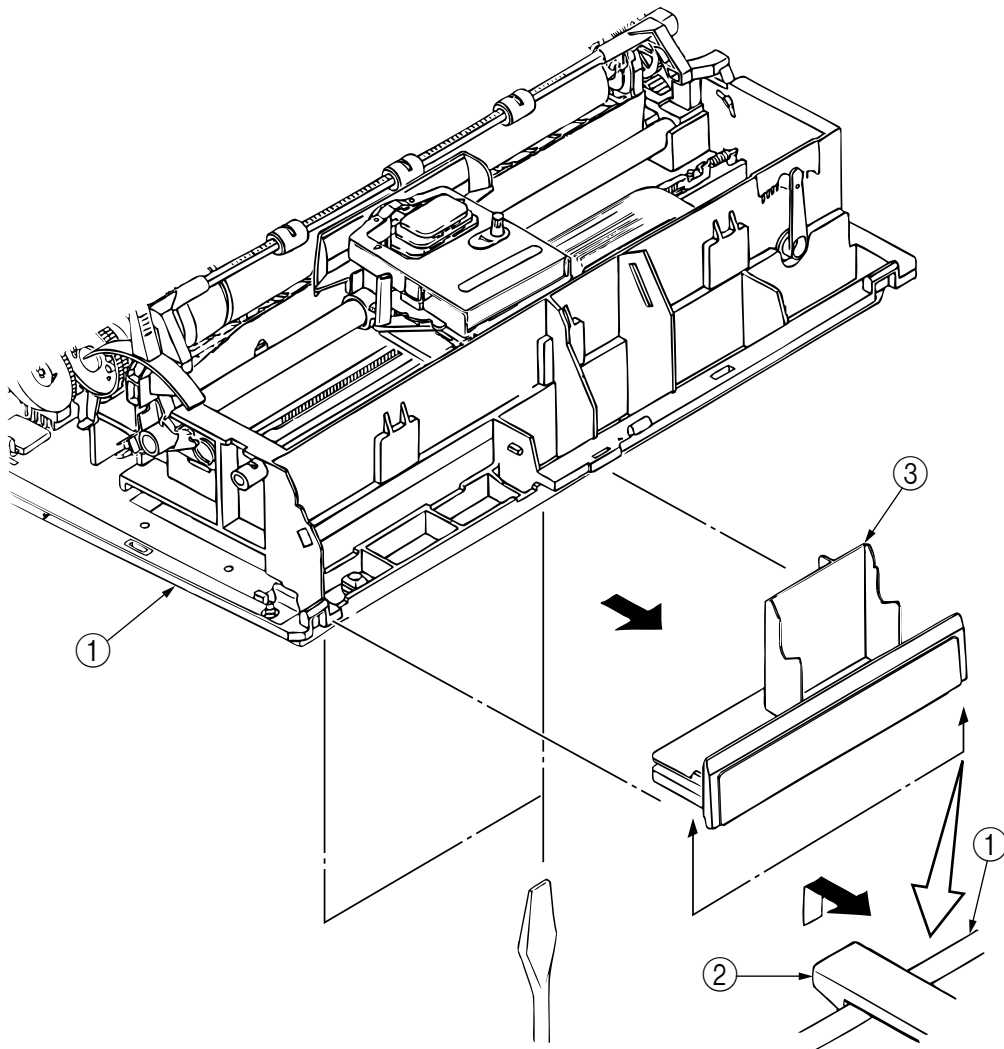
[Note on installation]

1. Insert the claws ① and ② on the base cover ① into the main frame ③. Then, attach the cover while fitting the claws ②.



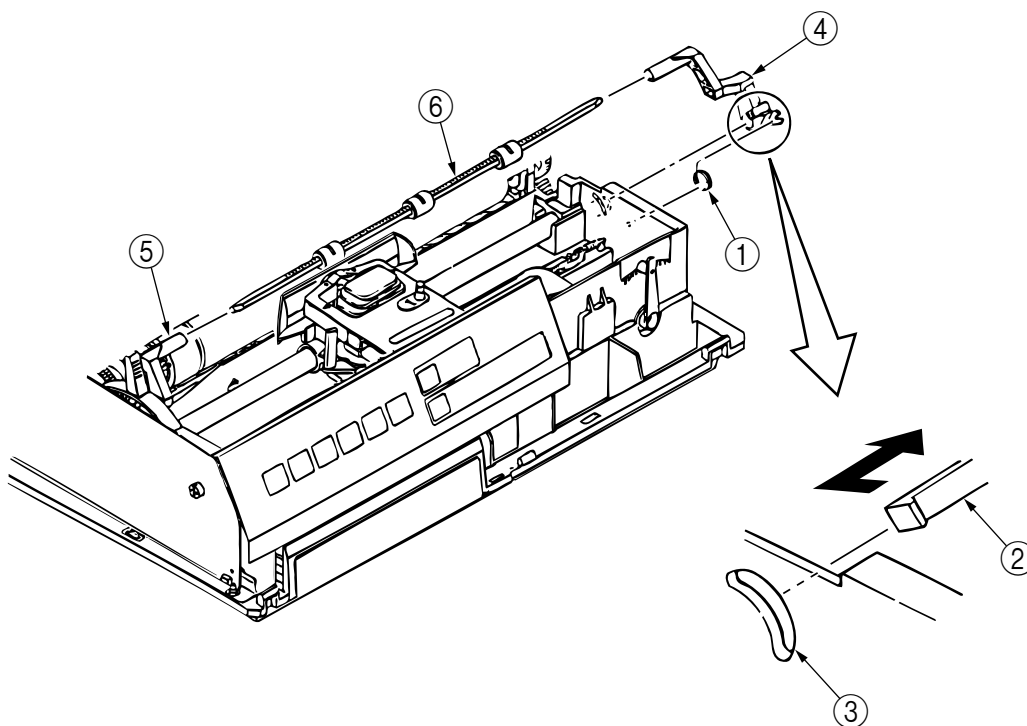
3.3.8 Support panel

- (1) Detach the operation panel. (See 3.3.4 step (2).)
- (2) Insert a flat-blade screwdriver from the back of the main frame ① and push the two claws ② on the support panel ③ to unlock it. Pull the panel toward you to detach it.



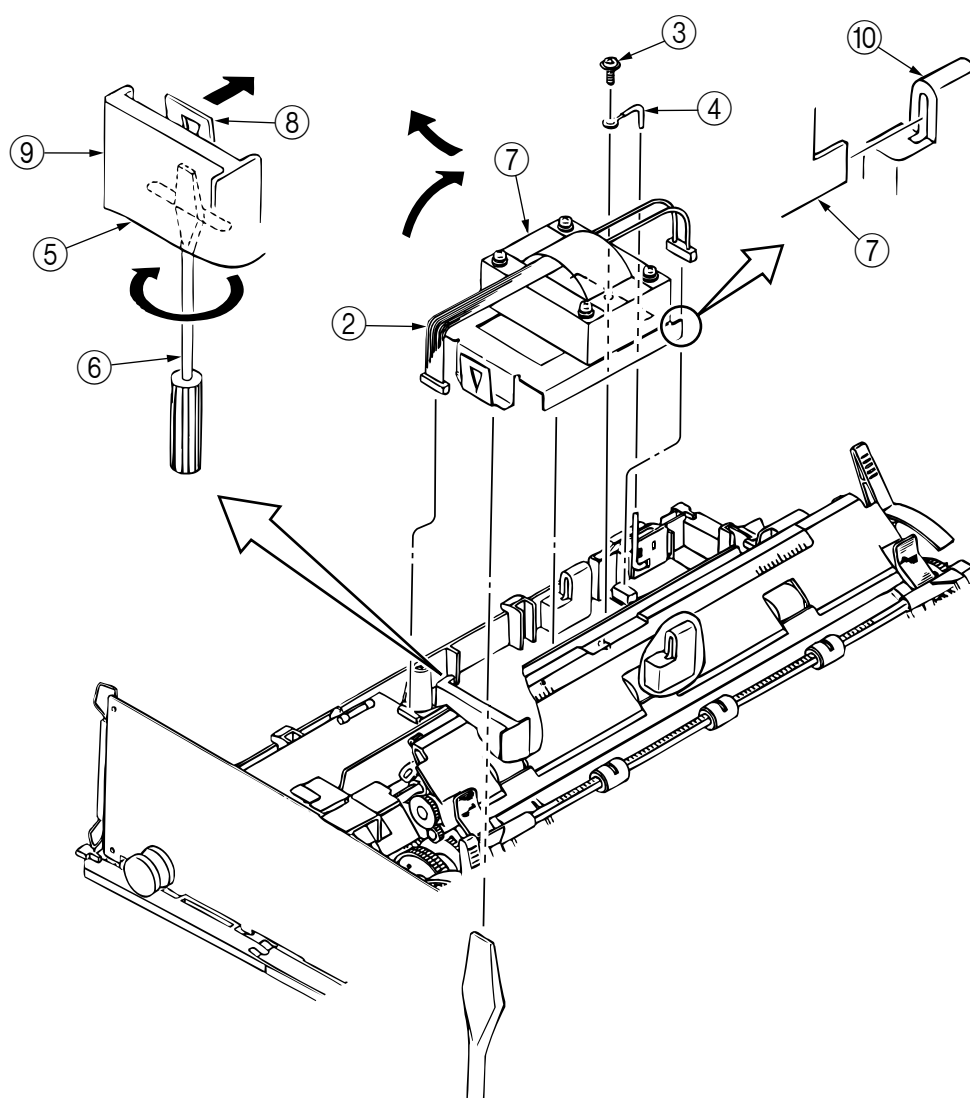
3.3.9 Bail bar

- (1) Detach the upper cover assembly. (See 3.3.3 (3).)
- (2) Detach the bail arm (L). (See 3.3.6.)
- (3) Detach the bail arm spring (R) ① with pliers.
- (4) Push the claw ② outward and detach the bail arm (R) ④ by pulling it through the guide hole ③ in the main frame.



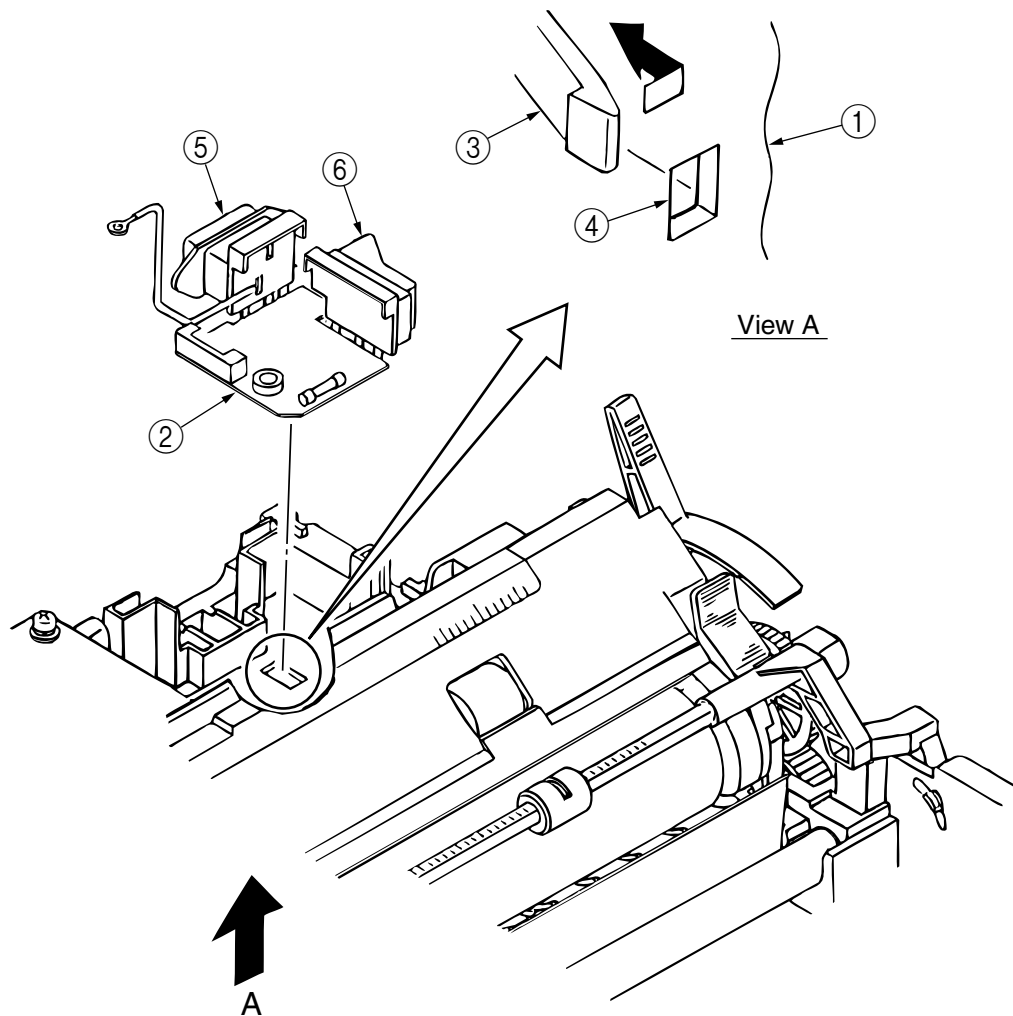
3.3.10 Transformer

- (1) Detach the upper cover assembly. (See 3.3.3 (3).)
- (2) Disconnect the cable ① from the filter assembly and cable ② from the power supply board.
- (3) Detach the screw ③ and grounding cord ④.
- (4) Insert a flat-blade screwdriver ⑥ into the main frame ⑤ from under the back, pull the screwdriver to push the lock spring ⑧ to the right on the transformer and detach the spring ⑧ from the transformer clamp A ⑨.
- (5) Lift the left side of the transformer ⑦ and detach it from the transformer clamp B ⑩ by pulling it to the left.





3.3.11 Filter assembly

- (1) Detach the transformer. (See 3.3.10.)
- (2) Detach the claw ③ of the filter assembly ② from its locking position ④ by pushing it from the bottom of the main frame ①.
- (3) Detach the filter assembly ② by lifting the AC inlet ⑤ and AC POWER switch ⑥ from the guide of the main frame.



3.3.12 Power supply board

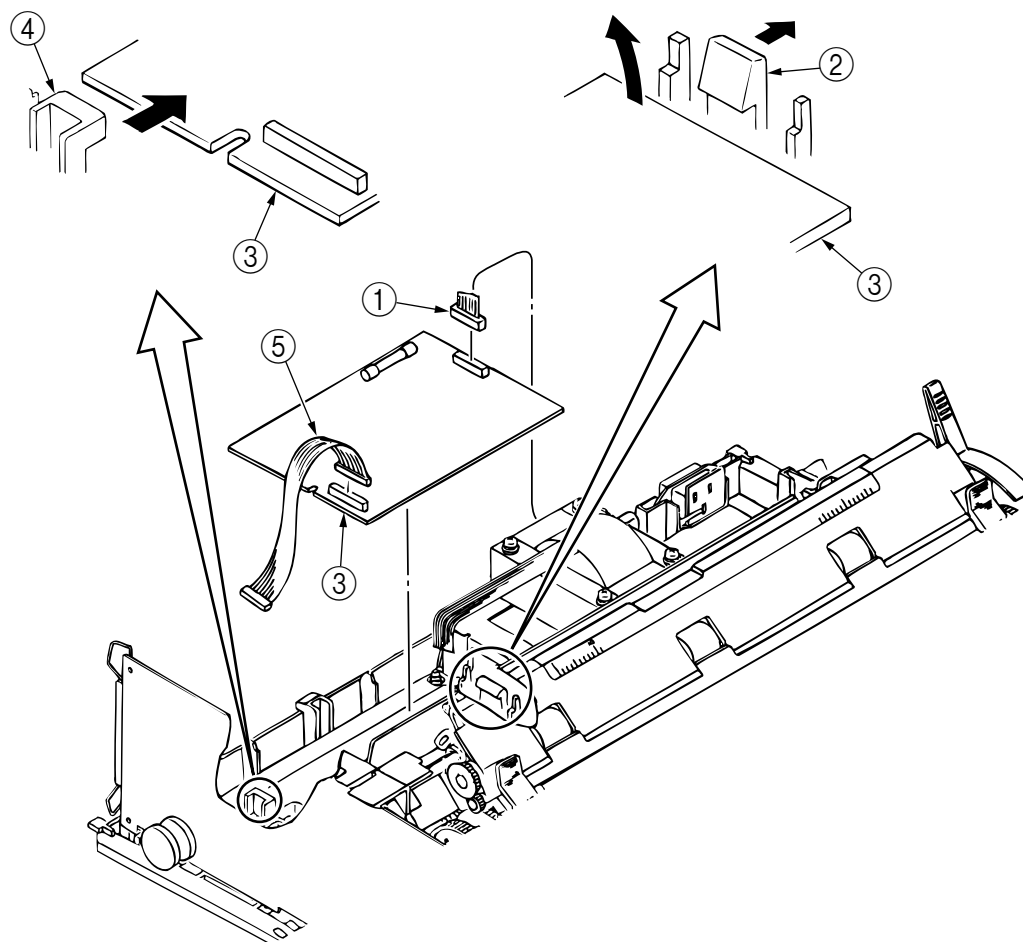
 Warning	Risk of Electric Shock	
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There is a risk of electric shock during replacement of the power supply.

Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

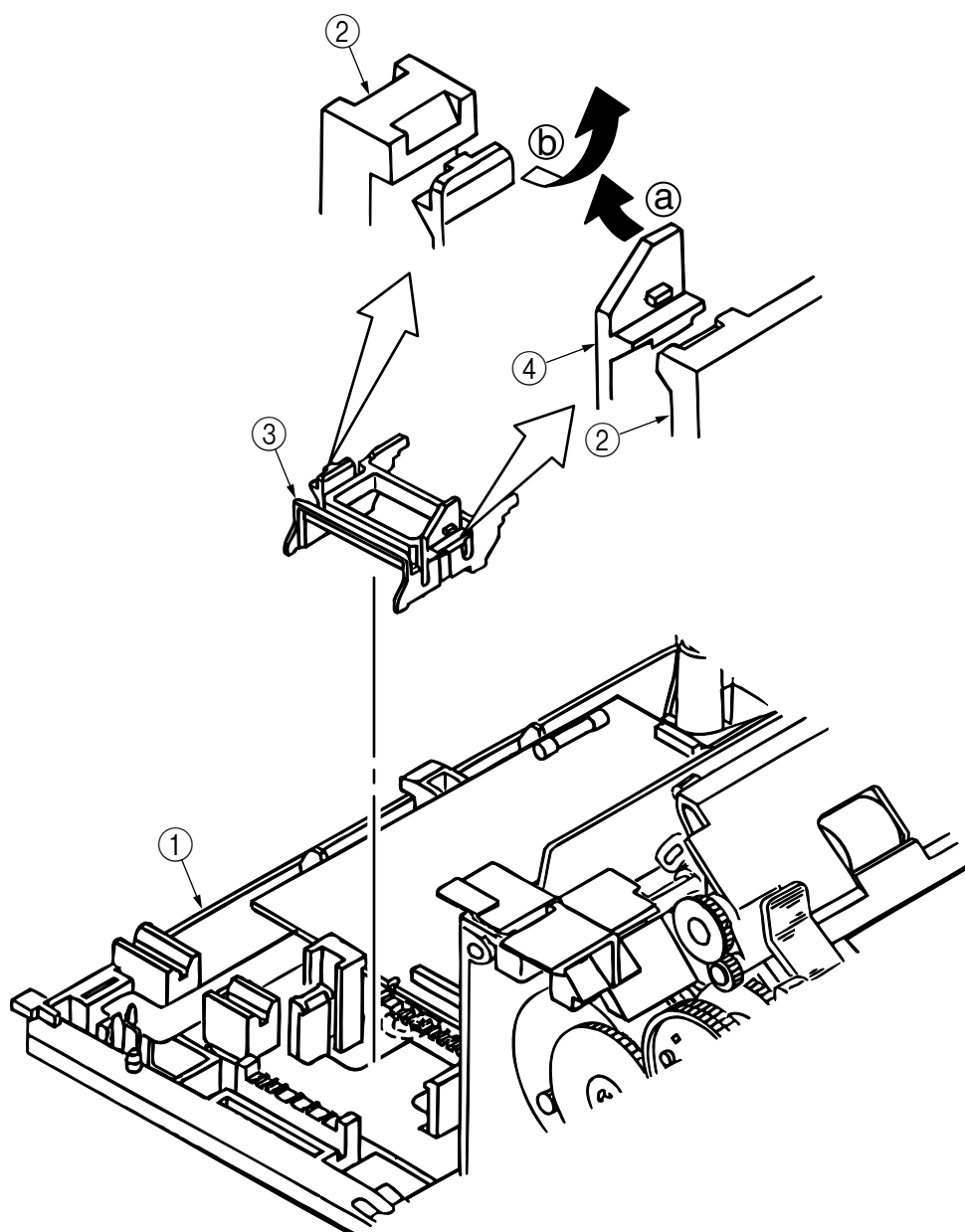
The capacitor may take one minute to complete discharge after the AC cable is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

- (1) Detach the upper cover assembly. (See 3.3.3(3).)
- (2) Disconnect the transformer cable ① and connector code ⑤.
- (3) Push the board clamp claw ② to the right, lift the right side of the power supply board ③, and detach its left side from the PCB holder.



3.3.13 Power interconnect module

- (1) Detach the control board (See 3.3.5.)
- (2) Detach the power supply board. (See 3.3.12.)
- (3) Detach the power interconnect module ③ by detaching the locking springs ④ on the module from the module clamps ② on the main frame ① (in the order of Arrows ①, ②).

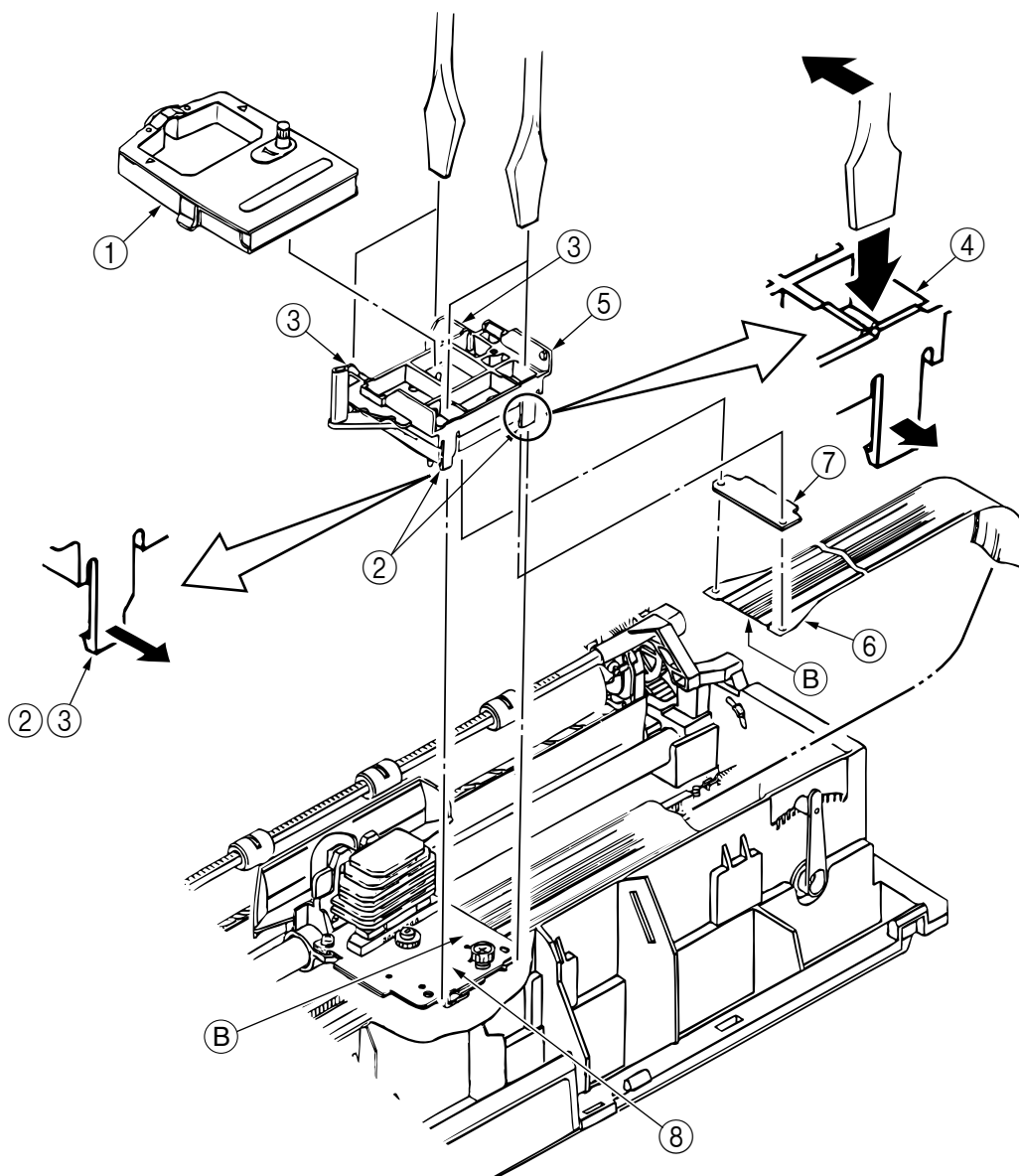


3.3.14 Ribbon drive gear assembly

- (1) Detach the upper cover Assembly. (See 3.3.3(3).)
- (2) Detach the ribbon cassette ①.
- (3) Unlock two front claws ② and two rear claws ③ by pushing the claws outward with a flat-blade screwdriver inserted through the hole ④.
- (4) Pull upwards and detach the ribbon feed gear assembly ⑤.
- (5) Detach the head cable ⑥, and contact pressure rubber ⑦ from the drive assembly.

[Notes on installation]

1. Do not touch the exposed terminals (crimp terminals) ⑧ on the carriage cable ⑥ and space motor assembly ⑧. Protect these terminals from dirt and dust.
2. Do not bend the carriage ⑤ at acute angles, as damage could occur.

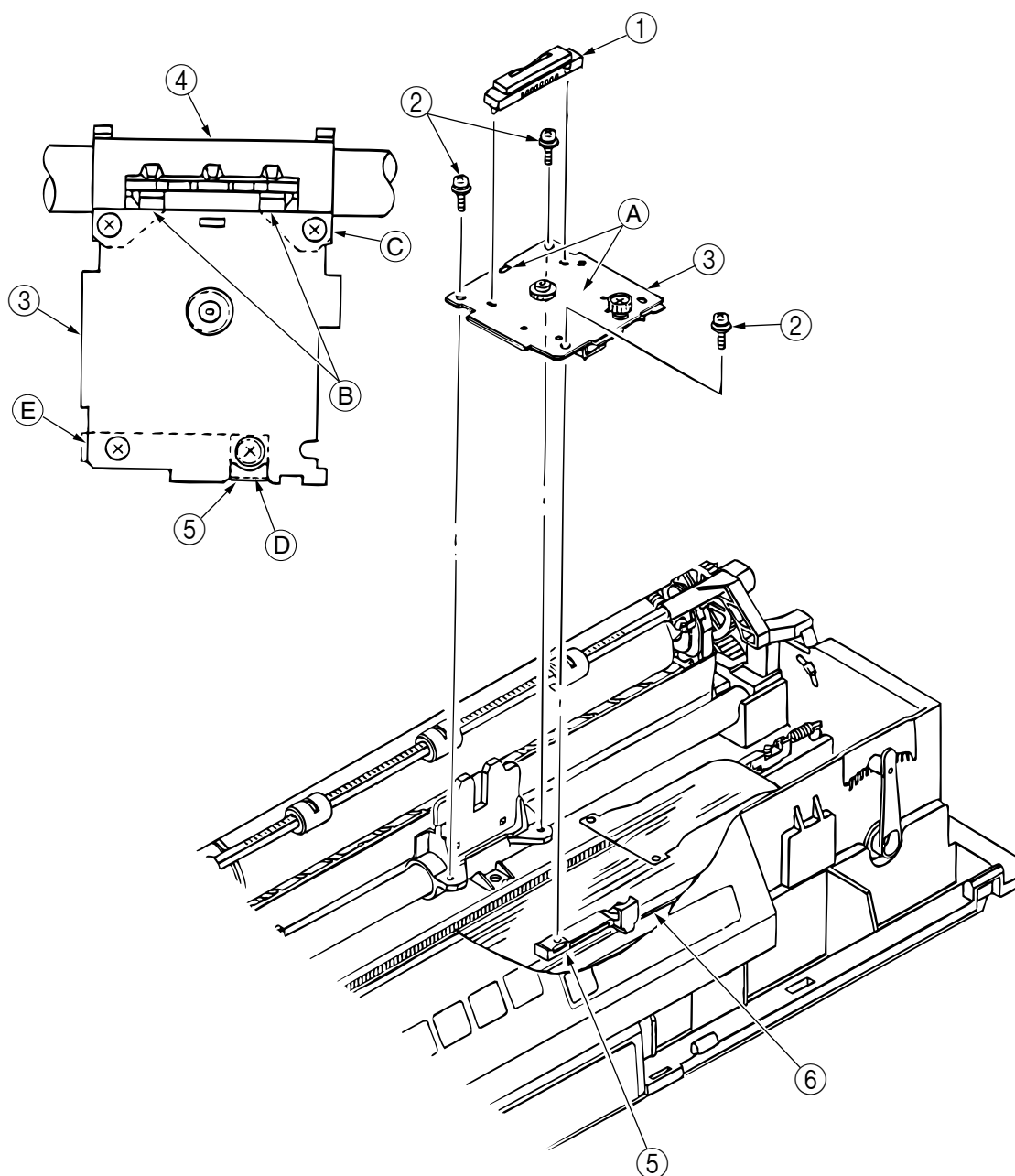


3.3.15 Space motor assembly

- (1) Detach the ribbon drive gear assembly. (See 3.3.14.)
- (2) Detach the connector ① by noting the direction of the notched side.
- (3) Remove the three screws ②.
- (4) Detach the space motor assembly ③.

[Notes on installation]

1. Do not touch the exposed terminals (crimp terminals) ①A on the space motor assembly ③.
Protect these terminals from dirt and dust.
2. Install the space motor assembly ③ by fitting ①B to carriage frame ④ and aligning the surface ①C with the corresponding carriage frame surface.
3. Install the slider ⑤ by fitting ①D and ①E to the space motor assembly ③. Make sure the slider is positioned under the lip of the guide rail ⑥.
4. After installing the ribbon drive gear and related assemblies, check and adjust the gap between the platen and printhead. (See 4.1.)

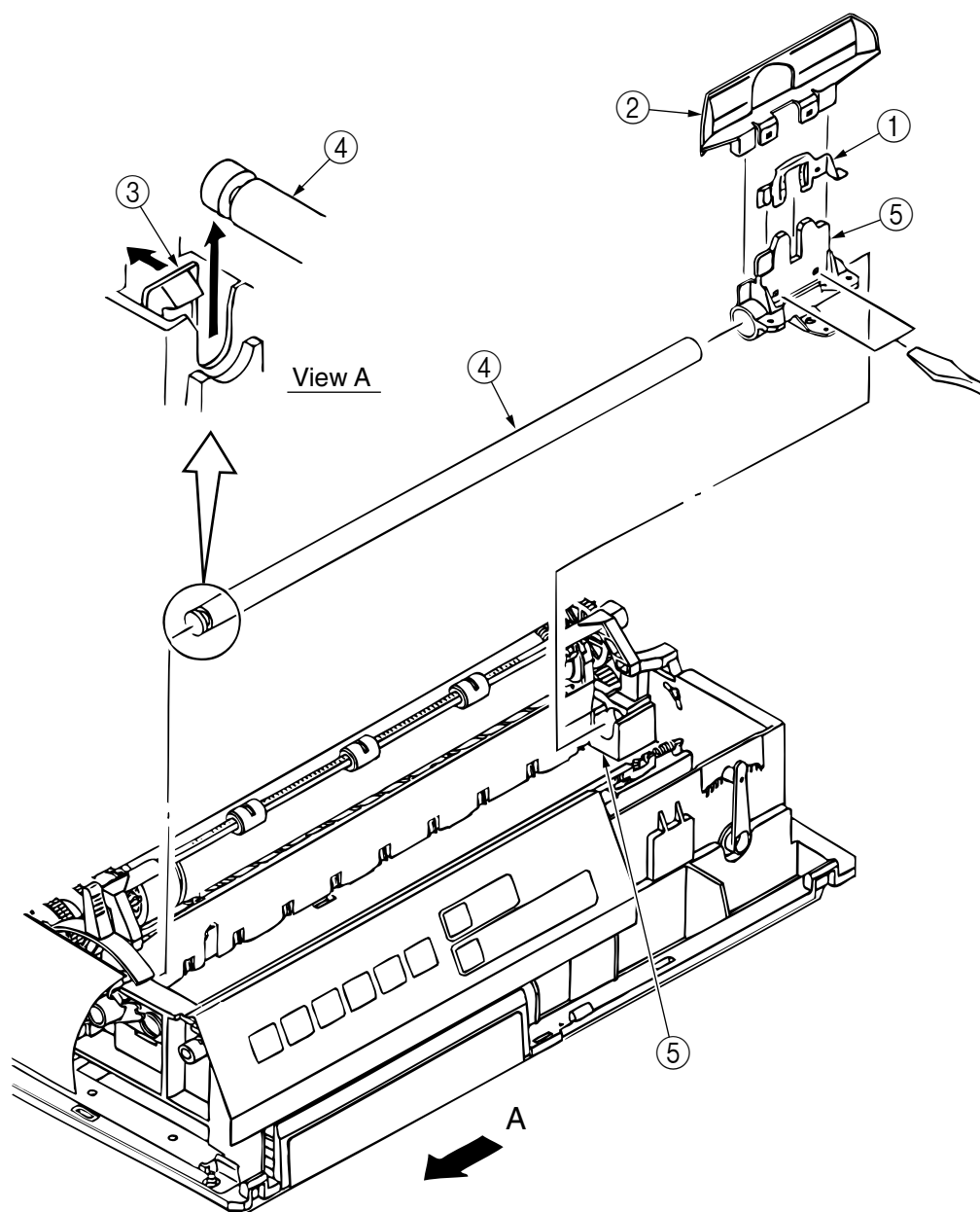


3.3.16 Carriage frame

- (1) Detach the space motor assembly. (See 3.3.15.)
- (2) Detach the head clamp ①.
- (3) Detach the ribbon protector ②.
- (4) Push the shaft clamp ③ to the left on the left end of the main frame and lift the carriage shaft ④. Then, pull out the right end of the shaft from the guide hole, and detach the shaft together with the carriage frame ⑤.
- (5) Pull out the carriage shaft ④ from the carriage frame ⑤.

[Note on installation]

1. After installing the carriage frame and related assemblies, adjust the gap between the platen and printhead. (See 4.1.)

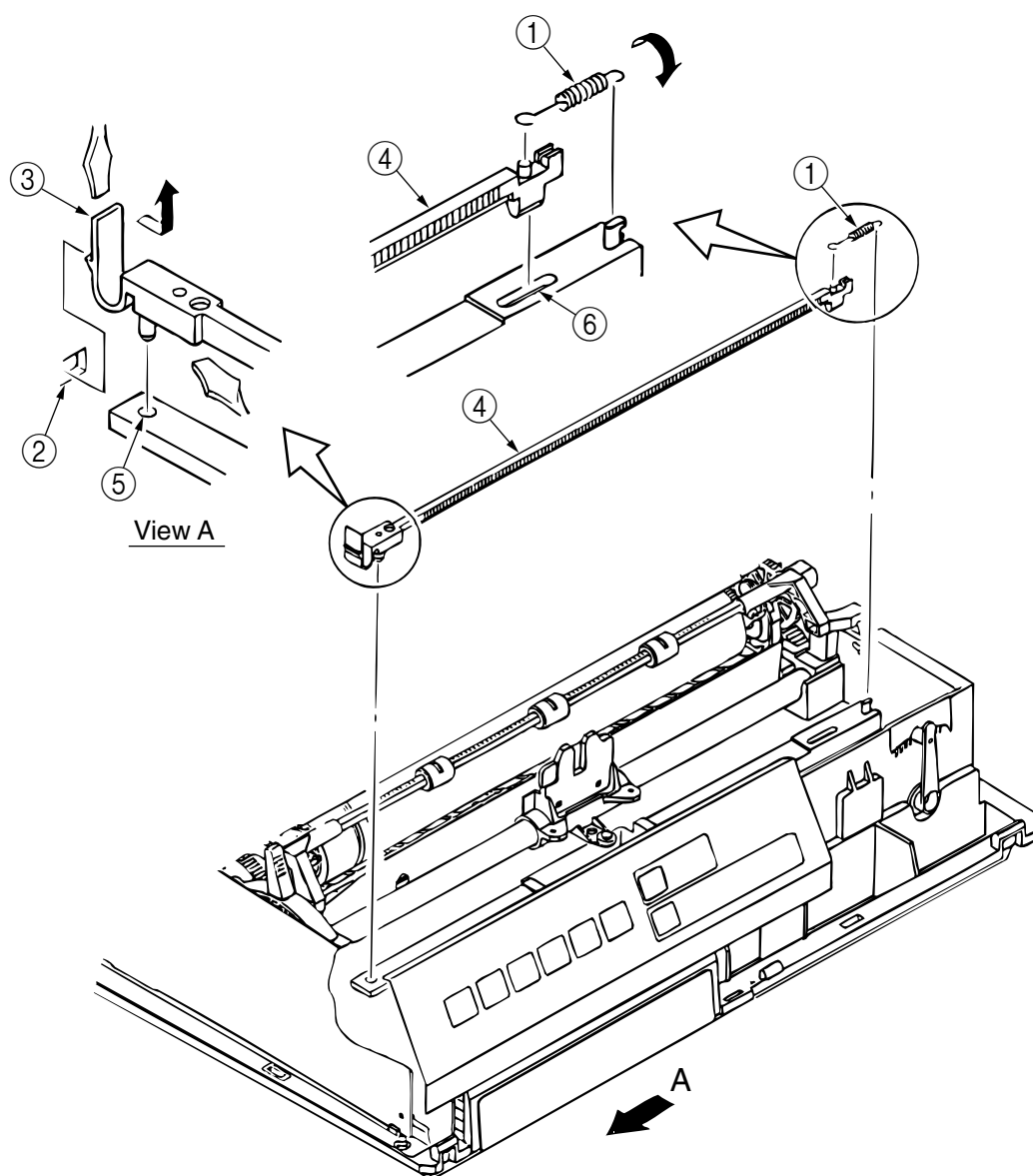


4.3.17 Space rack

- (1) Detach the space motor assembly. (See 3.3.15.)
- (2) Detach the spring ①.
- (3) Lift the space rack ④ while disengaging the claw ③ from the insertion hole ② in the main frame.

[Notes on installation]

1. When installing the spring ①, twist its right end 90° counterclockwise.
2. Install the rack so that it connects the two guide holes ⑤ and ⑥.
3. After installing the space motor and related assemblies, check and adjust the gap between the platen and printhead assembly. (See 4.1.)

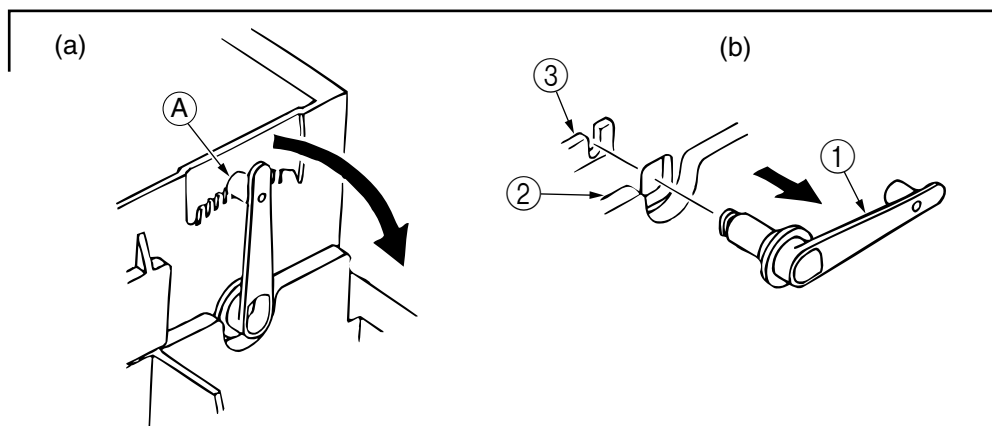
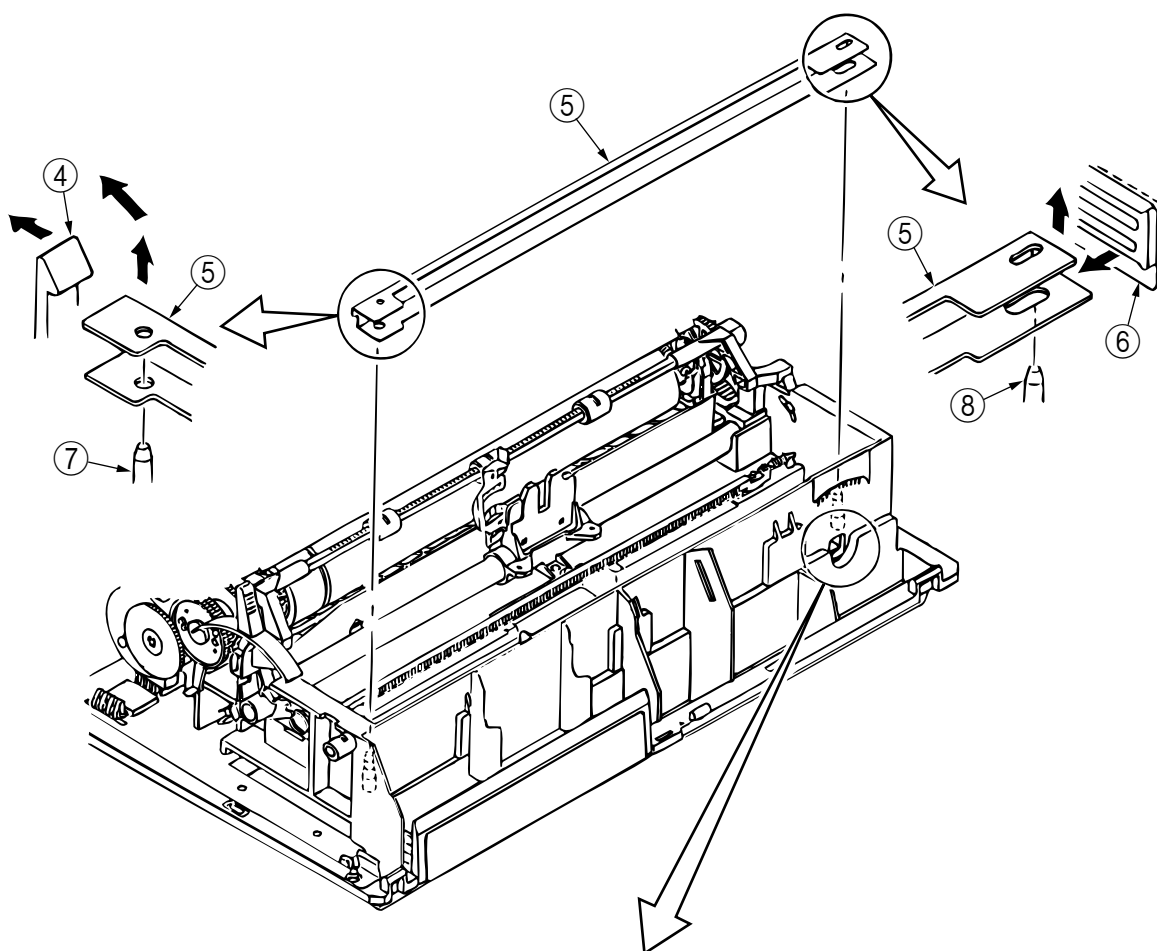


3.3.18 Guide rail

- (1) Detach the space motor assembly. (See 3.3.15.)
- (2) Detach the adjust ring cam ① by the following steps.
 - (a) Pull the adjusting cam ① outward turn it 90° clockwise to a horizontal position.
 - (b) Detach the cam by pulling it through the guide ③ in the main frame ②.
- (3) Push the claw ④ outward and disengage it from the left end of the guide rail ⑤.
- (4) Detach the right end of the guide rail ⑤ by pulling it out from the guide ⑥ in the main frame and lifting it.

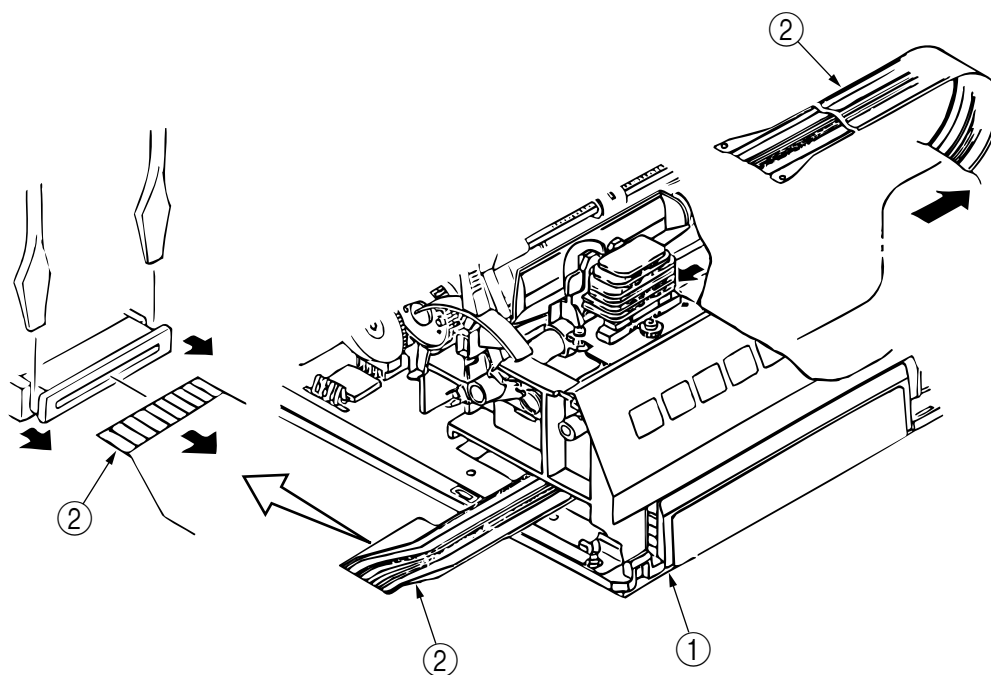
[Notes on installation]

1. Install the guide rail so that it connects the two guide points ⑦ and ⑧.
2. After installing the guide rail and related assemblies, adjust the gap between the platen and printhead. (See 4.1.)



3.3.19 Head cable

- (1) Detach the control board. (See 3.3.5.)
- (2) Detach the ribbon drive gear assembly. (See 3.3.14.)
- (3) Move the carriage to the left end ①, and detach the head cable ② by pulling it.

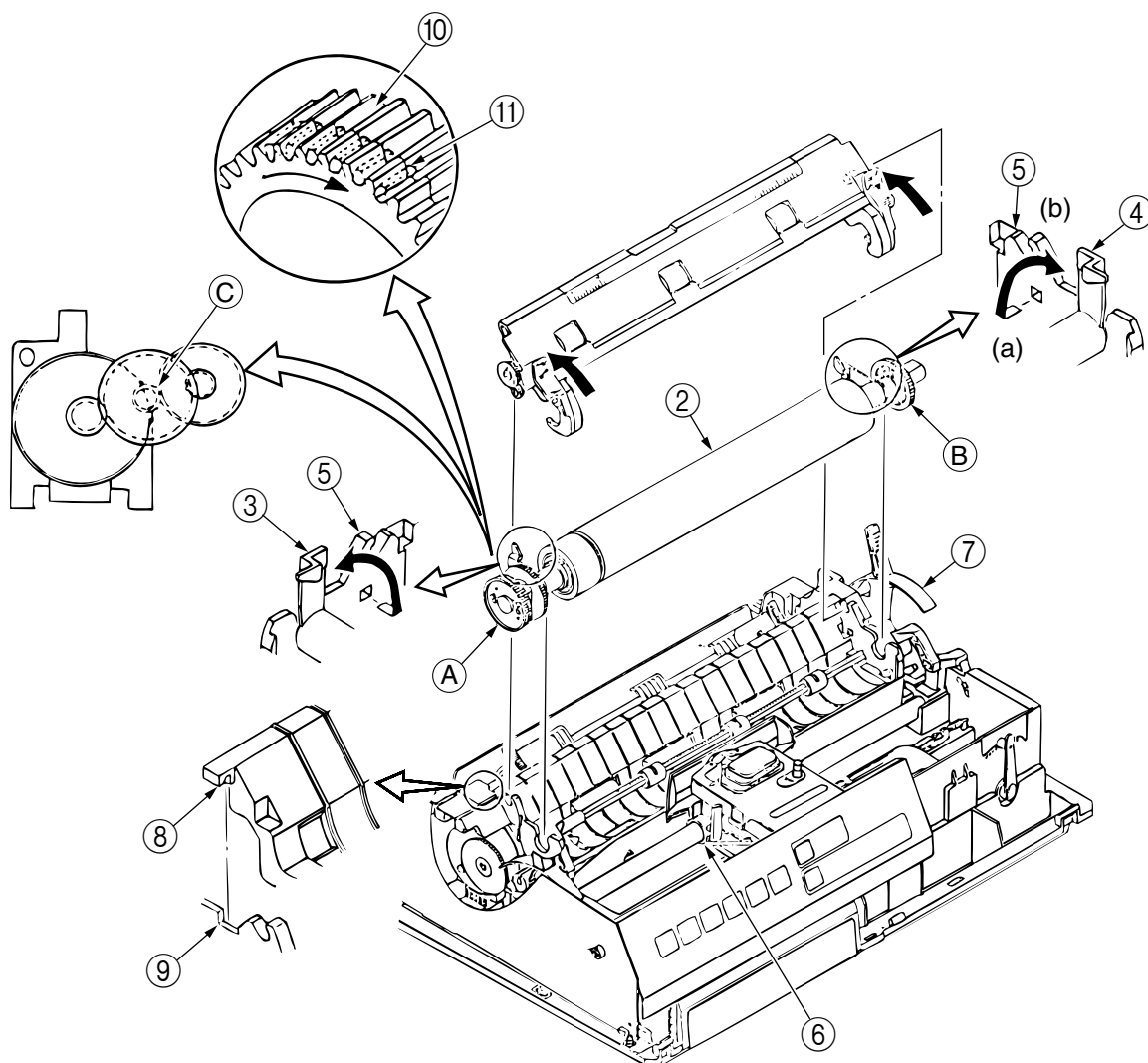


3.3.20 Platen assembly

- (1) Detach the upper cover assembly. (See 3.3.3(3).)
- (2) Detach the ruler guide ① by tilting it backward.
- (3) Move the bail arm toward the front of the printer.
- (4) Push the release lever to its rear position.
- (5) Pull the lock levers ③ and ④ in the direction of the arrow (a) and move them 90° upward (arrow (b)). This releases the platen assembly ② from the main frame ⑤.
- (6) Move the carriage frame ⑥ to the right end, lift the left end of the platen assembly ②, and return the frame to the left end.
- (7) Detach the platen assembly ② from the main frame by lifting its right end.

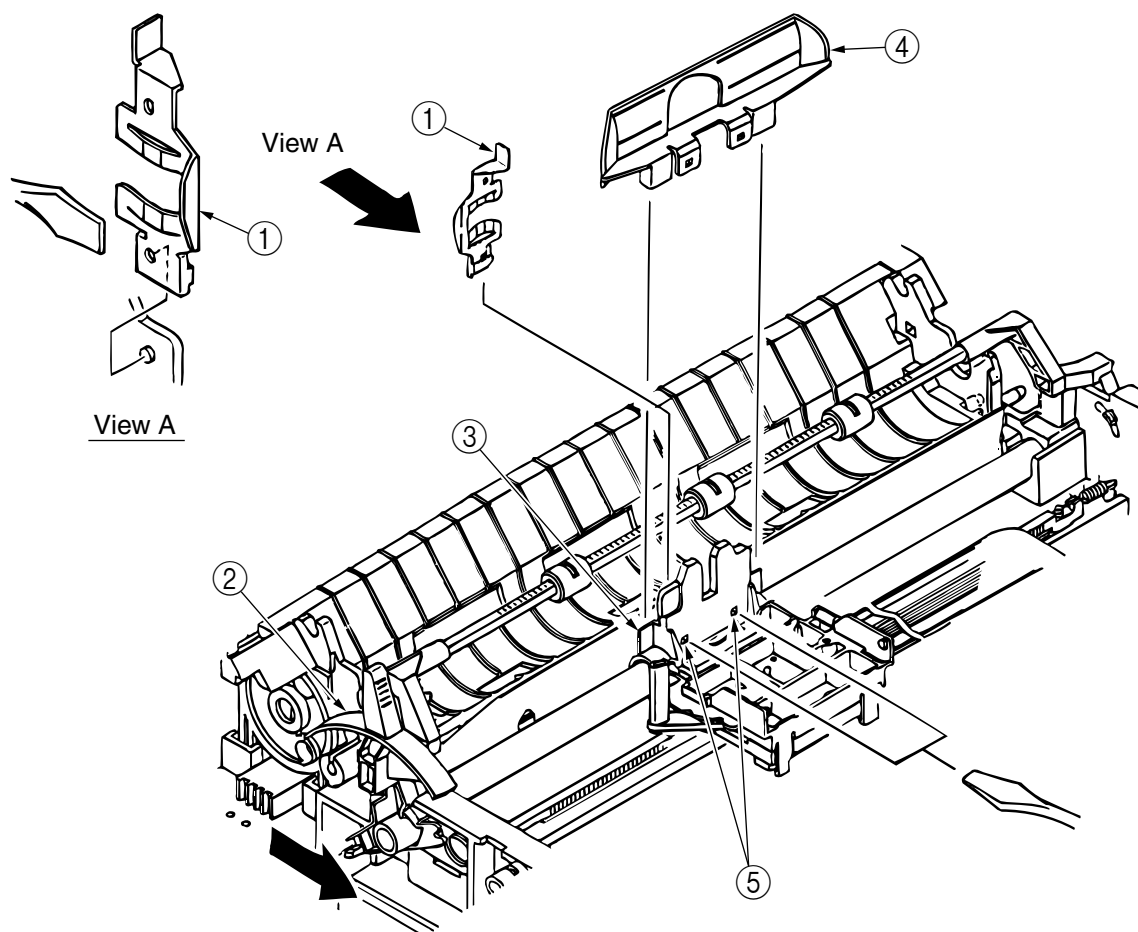
[Notes on installation]

1. When mounting the platen assembly, teeth of the platen gear ⑩ and bias gear ⑪ must be arranged in the same position and mesh the teeth (A) of LF motor gear. (Since there is a discrepancy of approx. quarter pitch between the bias gear and the platen gear, be careful for remounting two teeth of both gears in the same position.)
2. After installing the platen assembly, check that the gears engage securely at (A) and (B), and the platen turns smoothly.
3. Lock the platen assembly after setting the release lever ⑦ to the open (forward) position, and confirming that the paper chute positioning hole ⑧ is properly engaged in the main frame groove ⑨.



3.3.21 Ribbon protector

- (1) Detach the printhead. (See 3.3.2.)
- (2) Detach the platen assembly. (See 3.3.20.)
- (3) Push the supporting point **A** outward to detach the head clamp **①**.
- (4) Pull the bail lever **②** towards the front of the printer.
- (5) Detach the ribbon protector **④** from the carriage frame **③** by unlocking with a flat-blade screwdriver through a slot **⑤** in the frame.

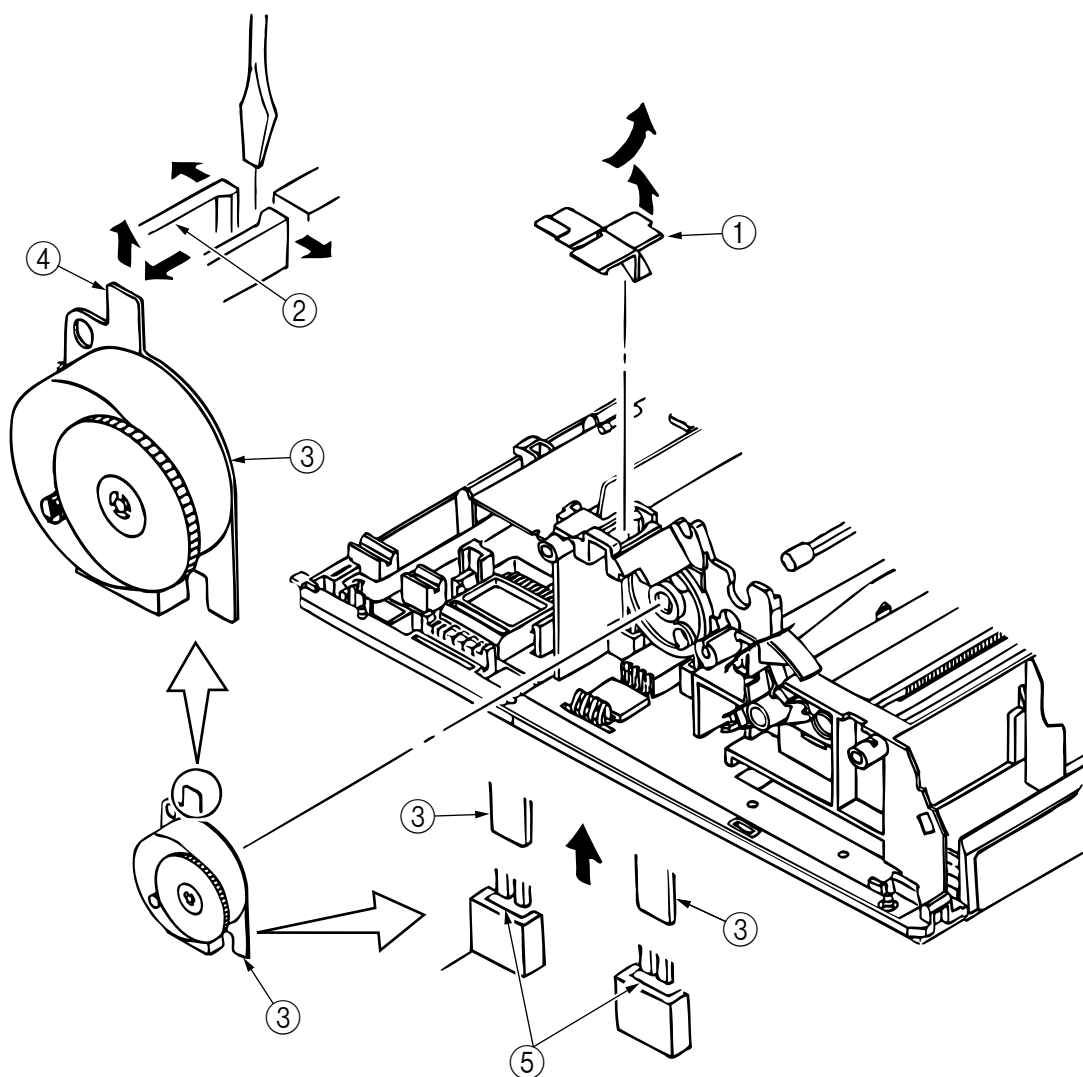


3.3.22 LF Motor

- (1) Detach the control board. (See 3.3.5.)
- (2) Detach the platen assembly. (See 3.3.20.)
- (3) Detach the board lock ①.
- (4) Open the lock lever ② and push the bracket ④ of the LF motor ③ outward to the left.
- (5) Detach the LF motor ③ from the guide hole ⑤ below.

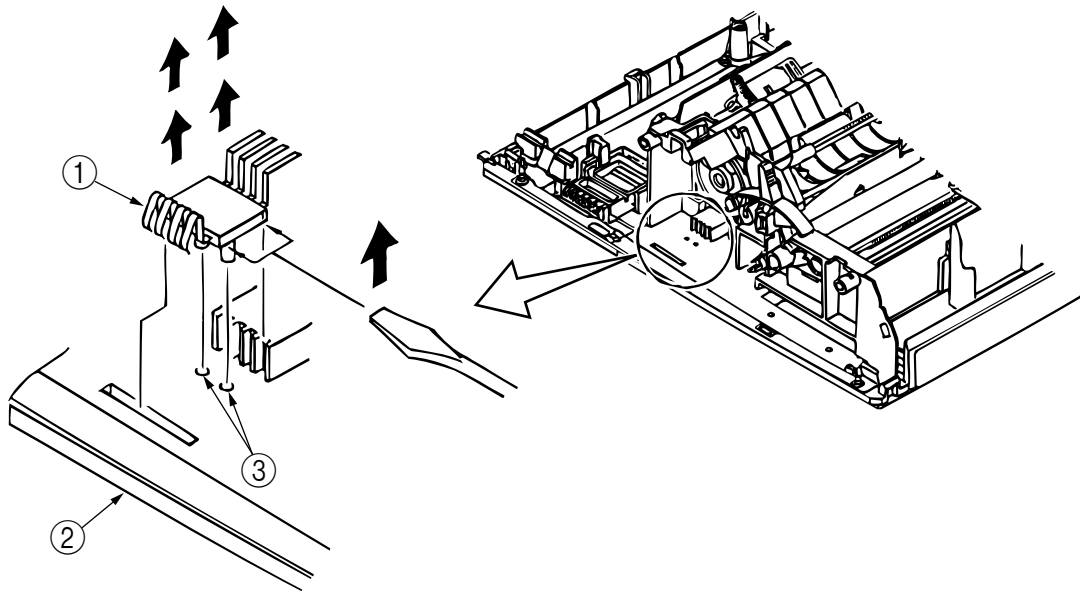
[Note on installation]

1. After installing the LF motor, check that the right and left gears of the platen engage securely, and the platen turns smoothly.



3.3.23 LF motor interconnect module

- (1) Detach the LF motor. (See 3.3.22.)
- (2) Insert a flat-blade screwdriver between the LF motor interconnect module ① and main frame ②, and detach the module ① from the two insertion holes ③.



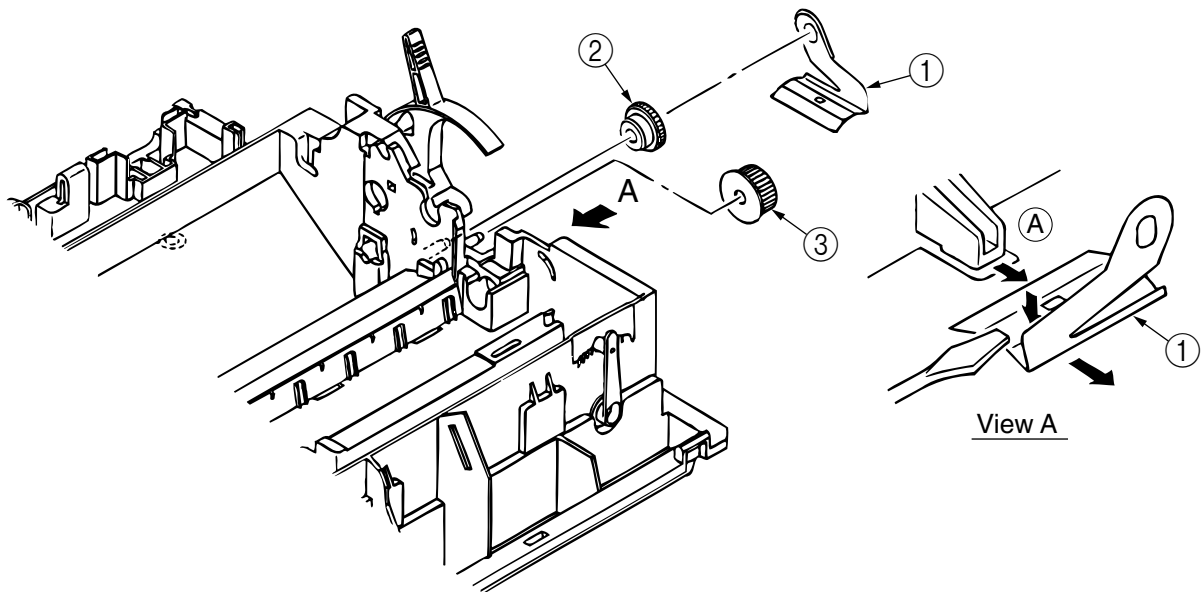
3.3.24 Idler gear

(1) Detach the platen assembly. (See 3.3.20.)

(2) Detach the reset spring ① as follows:

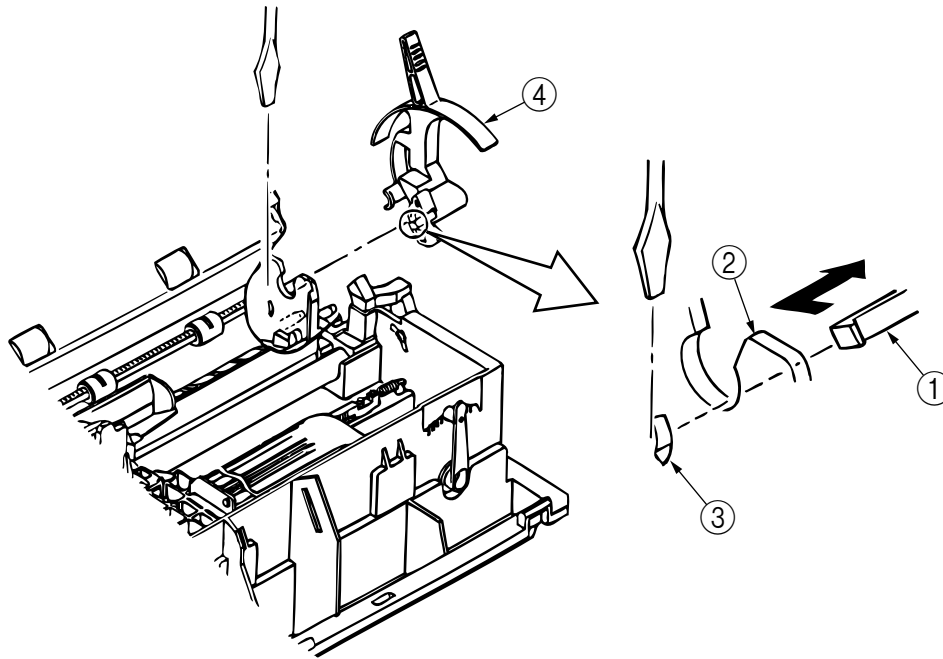
Push the reset spring ① at the top center downward with a flat-blade screwdriver, and pull the spring in the direction of the arrow ④ to remove it.

(3) Detach the change gear ② and idler gear ③.



3.3.25 Release lever

- (1) Detach the change gear. (See 3.3.24 (3).)
- (2) Detach the claw ① from the guide ③ in the main frame ②, and turn the release lever ④ forward. Pull outward to the right to remove from the main frame.

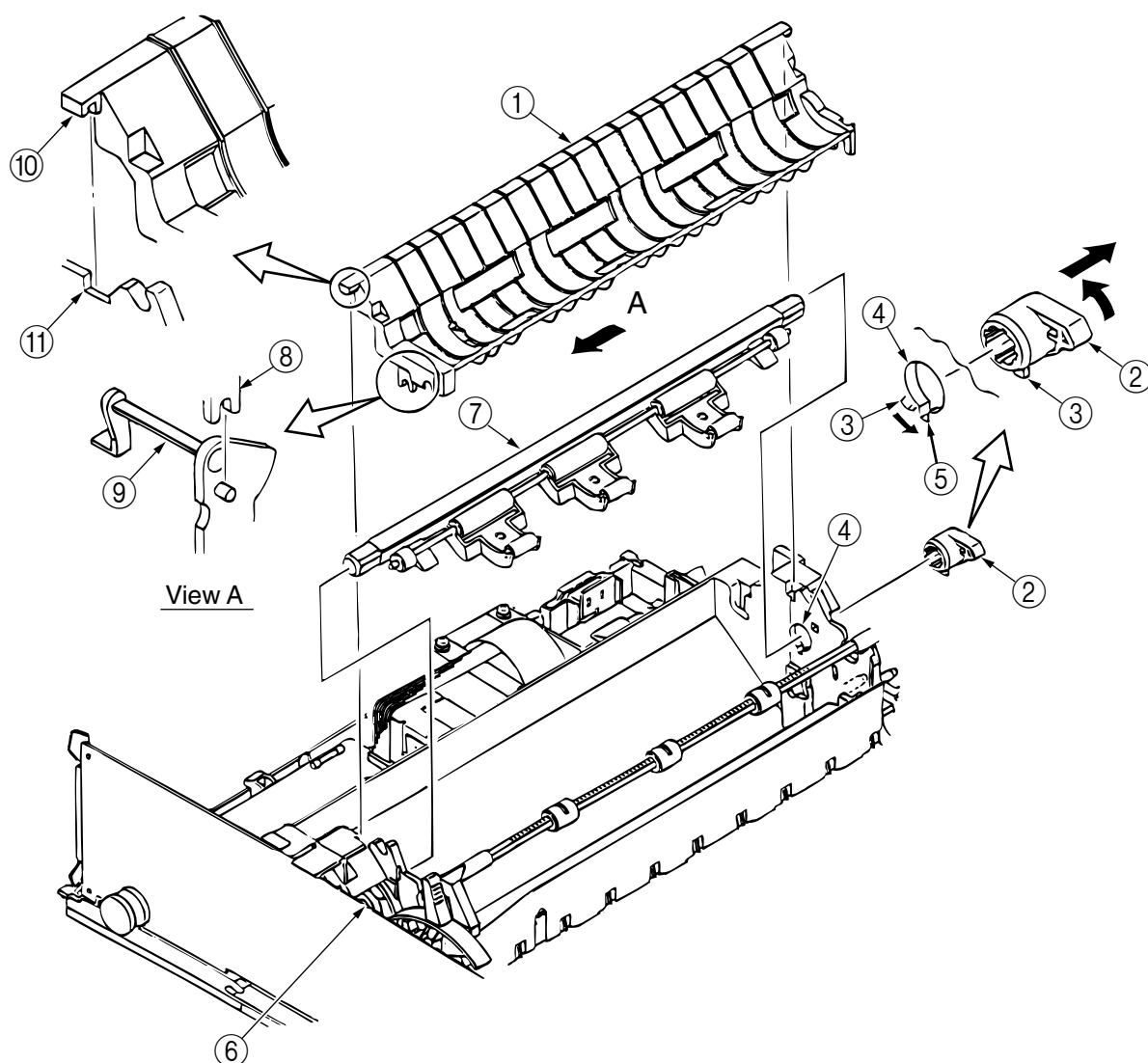


3.3.26 Pressure roller assembly

- (1) Detach the platen assembly. (See 3.3.20.)
- (2) Take out the paper chute ①.
- (3) Detach the release lever. (See 3.3.25.)
- (4) Turn the release link ② clockwise as viewed from View A as far as it goes. Then, detach the release link ② by detaching the claw ③ from the slot ⑤ in the guide hole ④ in the main frame.
- (5) Detach the pressure assembly ⑦ by sliding it out through the guide holes ④ and ⑥.

[Notes on installation]

1. Attach the paper end lever ⑧ on the paper chute to the shaft of the sensor lever ⑨.
2. Lock the platen assembly after setting the release lever to the open (forward) position, and confirming that the paper chute positioning hole ⑩ is properly engaged in the main frame groove ⑪.



3.3.27 Tractor assembly

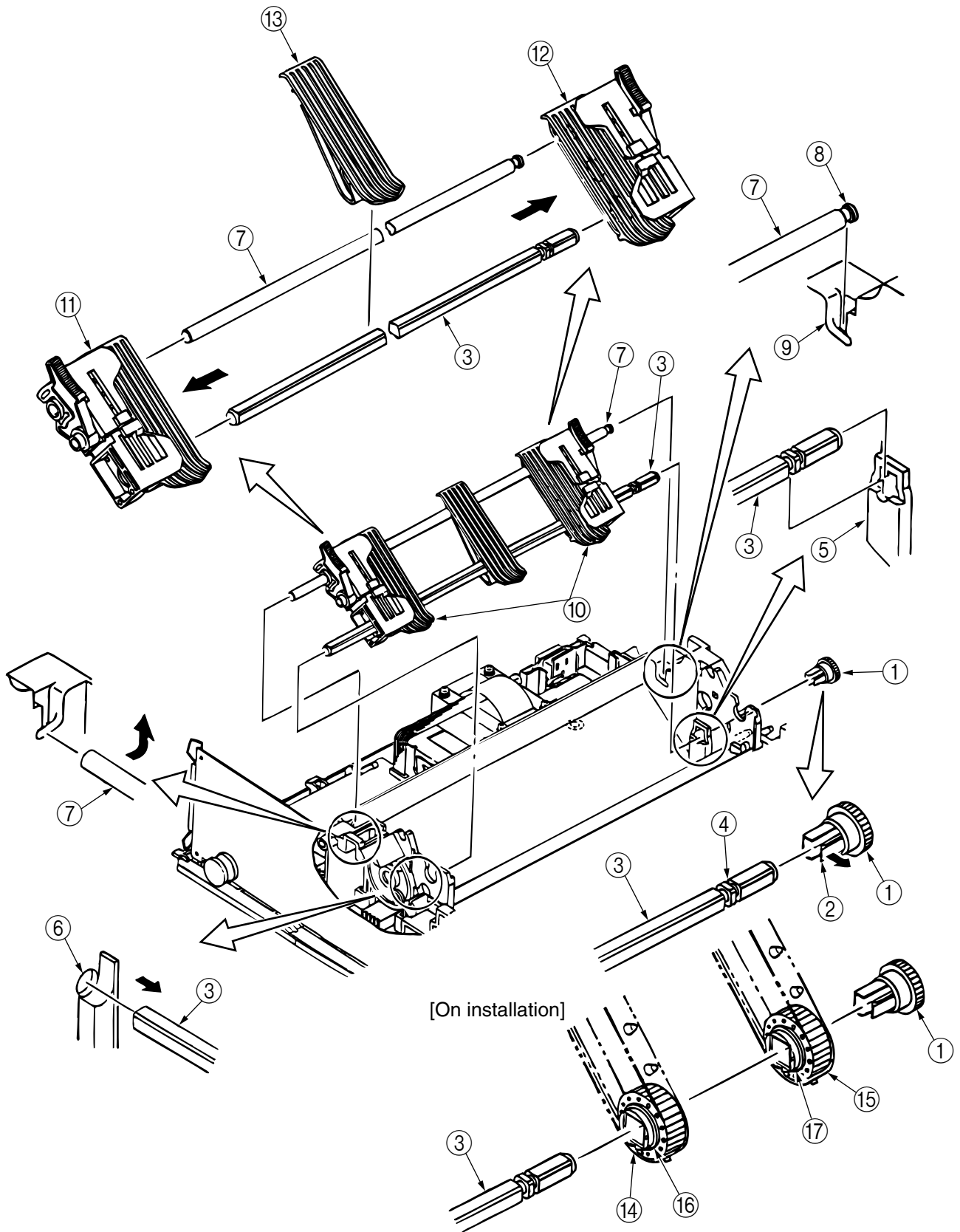
- (1) Detach the tractor gear ① as follows:

Push the claw ② of the tractor gear ① outward and detach it from the groove ④ in the drive shaft ③. Then, detach the gear to the right and remove.

- (2) Detach the pressure roller assembly. (See 3.3.26.)
- (3) Lift the drive shaft ③ above the guide ⑤ and slide it to the right until its left end is exposed from the guide hole ⑥.
- (4) Detach the tractor assembly ⑩ by detaching the slot ⑧ in the lock shaft ⑦ from the guide ⑨ and the drive shaft ③ from the right guide ⑤.
- (5) Detach the tractor frame (L) ⑪, tractor frame (R) ⑫, and sheet guide ⑬ from the two shafts.

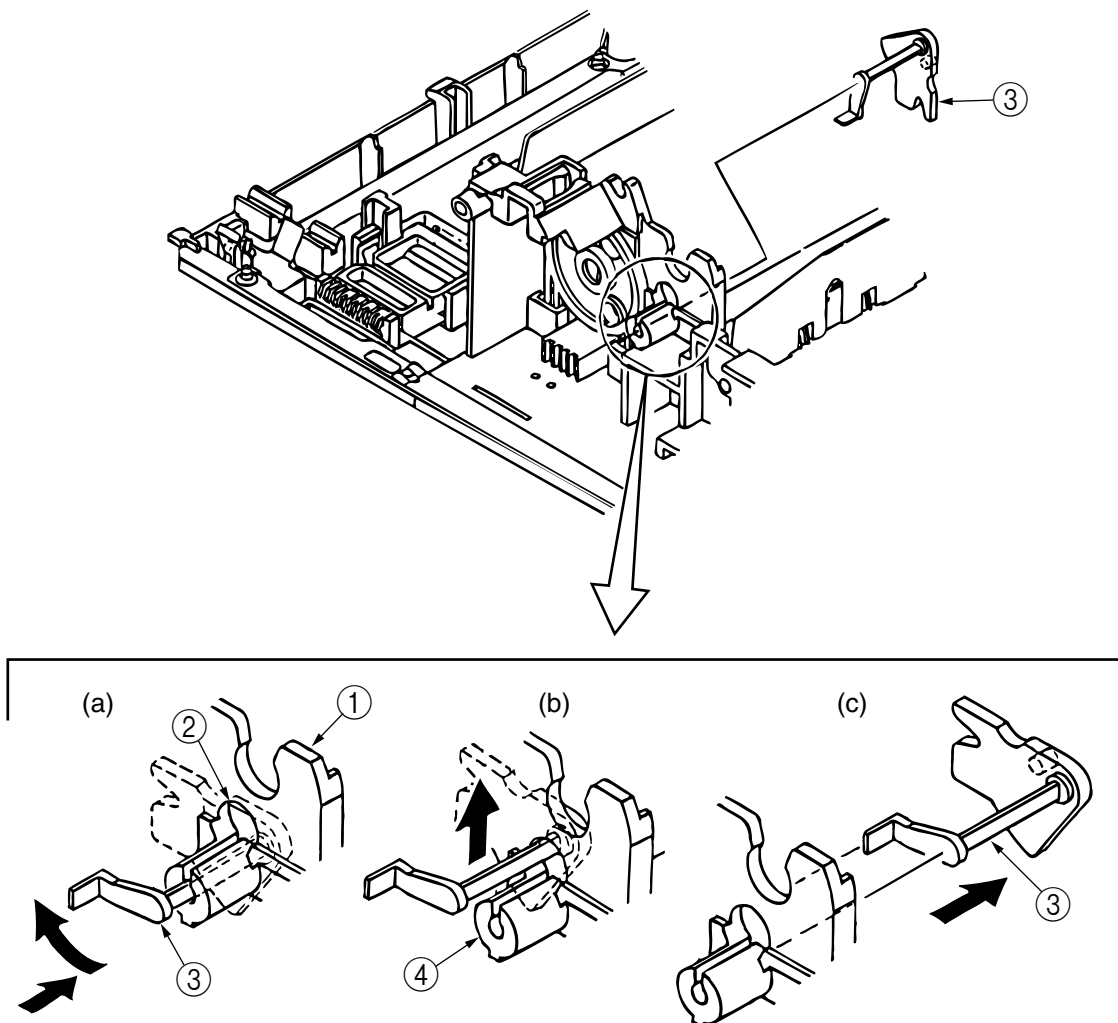
[Note on installation]

1. Adjust the projections ⑯ and ⑰ of the pin tractor wheel ⑭ and ⑮ on the tractor frame (L) and (R) so that the projections face the same direction. Then mount the frame on the drive shaft ③.



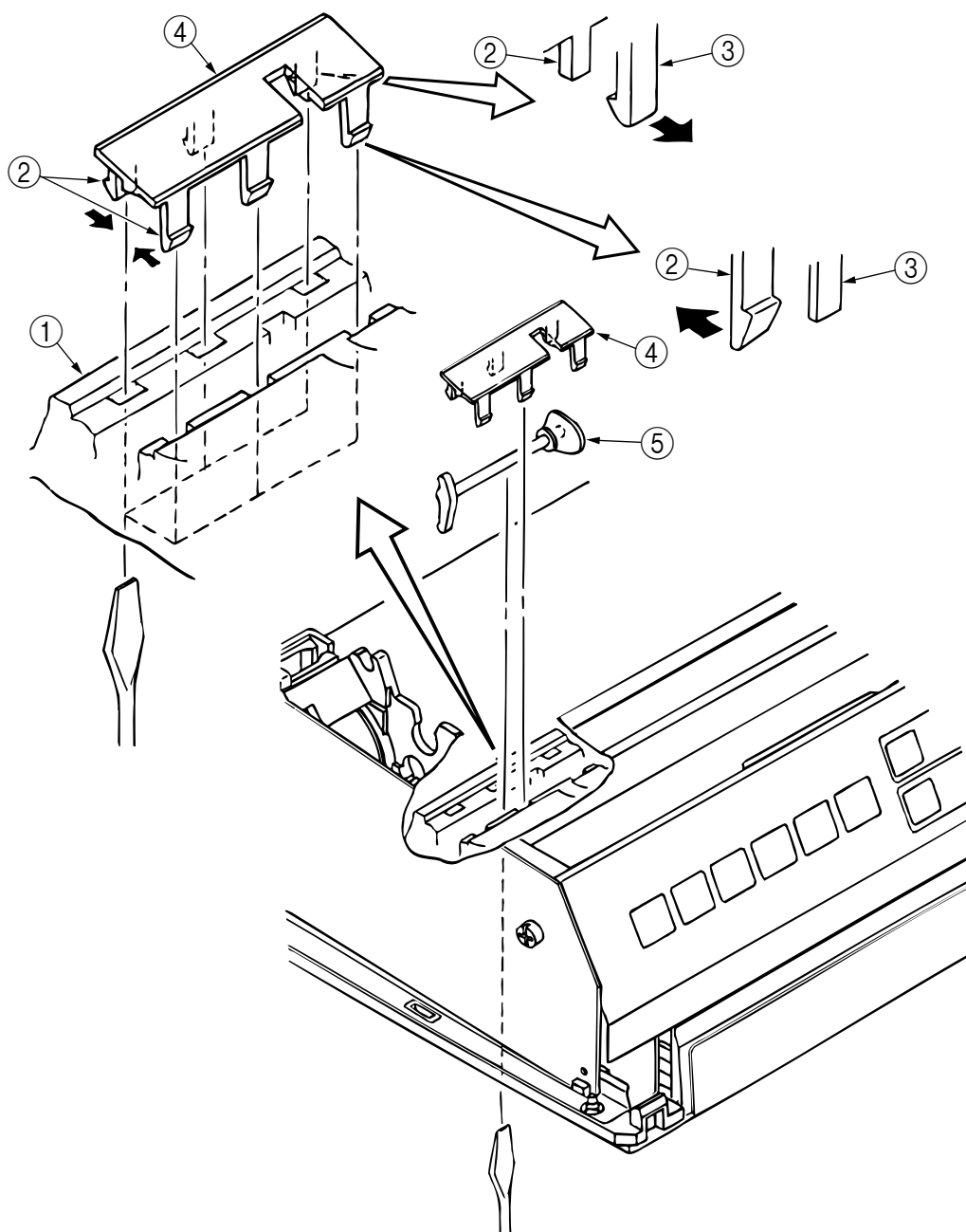
3.3.28 Sensor lever

- (1) Detach the LF motor. (See 3.3.22.)
- (2) Detach the tractor assembly. (See 3.3.27.)
- (3) Detach the sensor lever ③ from the guide hole ② in the main frame as follows:
 - (a) Turn the sensor lever ③ 90° clockwise.
 - (b) Detach the sensor lever ③ by moving it upward from the shaft support ④.
 - (c) Pull out the sensor lever from the guide hole ② in the main frame ①.



3.3.29 Paper end lever

- (1) Detach the tractor assembly. (See 3.3.27.)
- (2) Detach the six claws ② from the bottom side of the main frame ① with a flat-blade screwdriver.
- (3) Then, detach the sensor cover ④ by pulling it upwards.



3.3.30 Leaf spring

- (1) Detach the platen assembly. (See 3.3.20.)
- (2) Detach the coupling holes ① from the projections ③ on the main frame ② with a flat-blade screwdriver sequentially from left to right in order to detach the leaf spring ④.

[Note on installation]

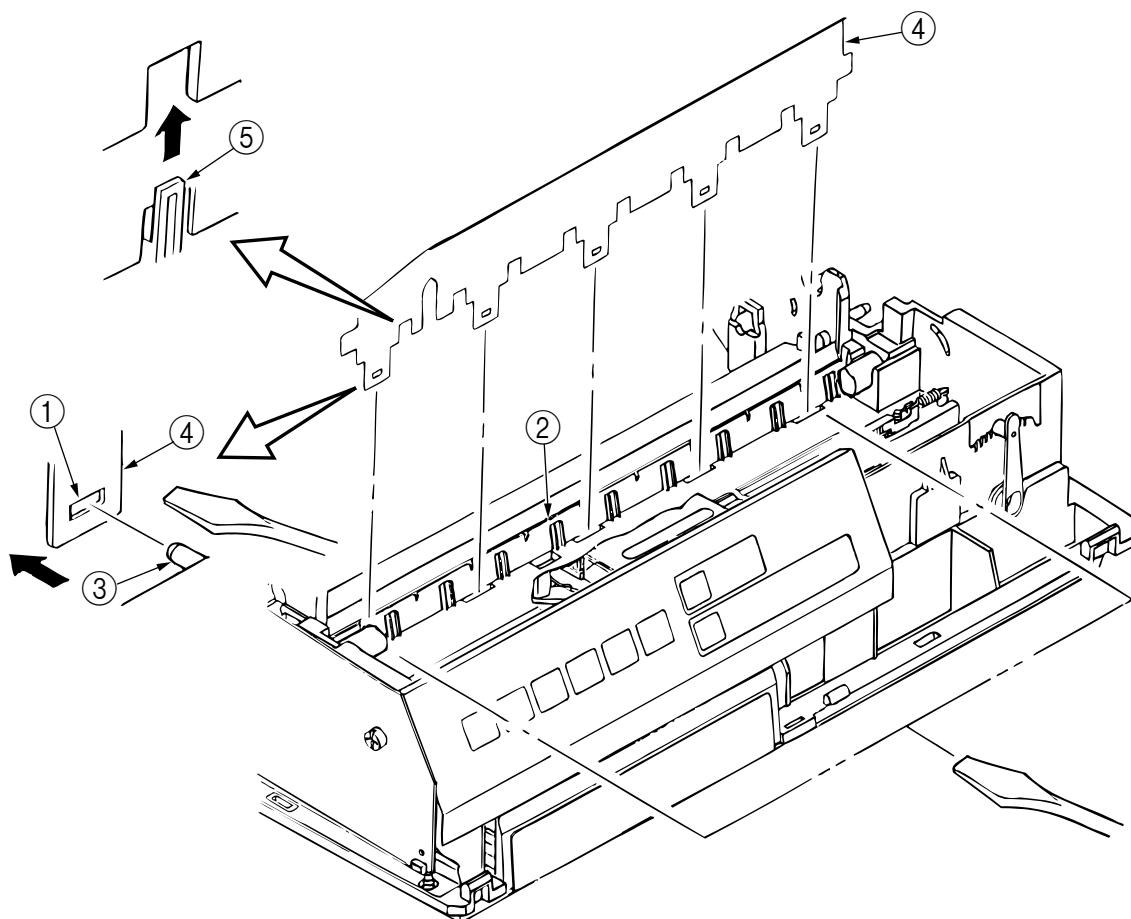
1. Install the leaf spring so that it is fitted into the projections ③ and guide plates ⑤ simultaneously.

Coupling holes : ML320 5 points

ML321 7 points

Guide plates : ML320 10 points

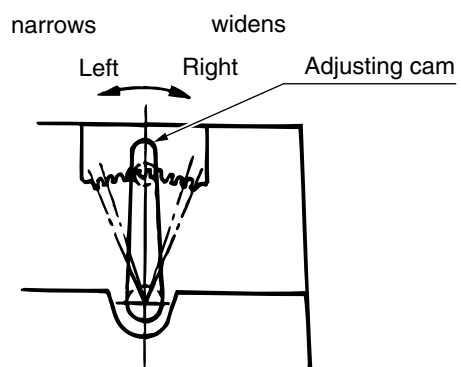
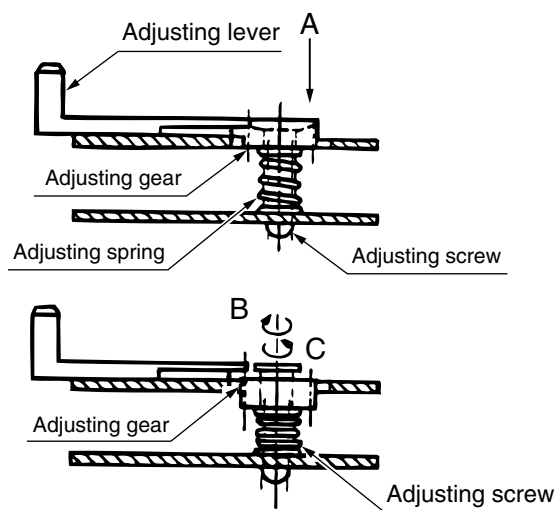
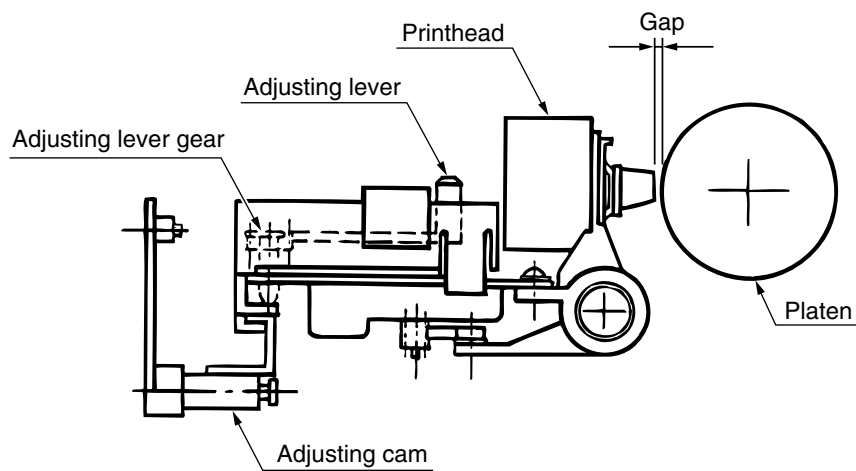
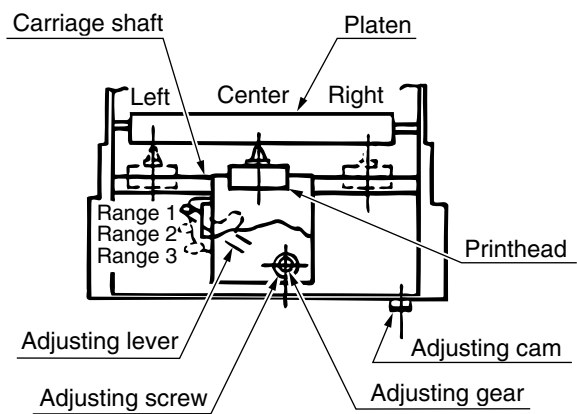
ML321 13 points



4. ADJUSTMENT

4.1 Gap Between The Platen And Printhead

- (1) Adjustment value : 0.018 ± 0.002 inch (0.45 ± 0.05 mm)
- (2) Adjustment position : Perform at the left, center and right end of the platen.
- (3) Adjustment method
 - (a) Push down the release lever to open.
 - (b) Set the adjusting lever to the range 1 position, press the adjusting gear to the downward (A) direction, and release the engaged adjusting lever and adjusting gear.
 - (c) Adjust by turning the adjusting screw to the B or C direction.
 - (d) For the difference in gap between the right and left sides of the platen, turn the adjusting cam clockwise or counterclockwise to finalize the adjust.
 - (e) Make sure that the gap is 0.028 ± 0.002 inch (0.71 ± 0.05 mm) with the adjusting lever at range 3.



5. CLEANING AND LUBRICATION

5.1 Cleaning

[Note] Perform cleaning after turning off the POWER switch.

Clean the inside of the printer periodically according to the following items.

Cleaning period : Every 6 months of operation or 300 hours, whichever comes first.

Required time : About 10 min.

Tools to be used : Dry soft cloth (such as gauze, etc.) (A vacuum cleaner is preferable.)

Cleaning area : As in Table 5-1.

Table 5-1 Areas to be cleaned

Area to be cleaned	Contents of cleaning
Carriage shaft and its vicinity	Remove the paper dust and wipe off dirt, dust, ribbon waste, etc.
Paper line feed surface	Clean the pin rollers and the platen with a cleaning liquid.
Paper end sensor	Wipe off the dust stuck to the sensors.

5.2 Lubrication

(1) Lubricant

- (a) Alvania grease # 2EP (or equivalent) GEP
- (b) Pan motor oil (or equivalent) PM

(2) Amount of lubricant

- (a) ordinary ① : About 3 to 4 drops oil or 0.008 inch (0.2 mm) thick grease.
- (b) small amount ② : About one drop of oil.

(3) Period of lubrication

This equipment is designed to be maintenance-free and oiling is unnecessary while in operation.

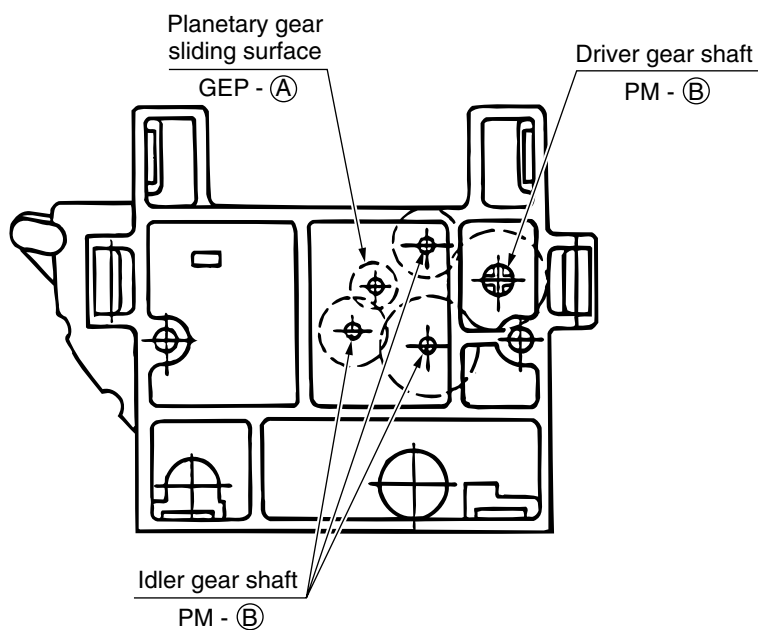
However, when reassembling or cleaning of oiled parts is performed, lubricant is required.

(4) Areas not to lubricate.

Item No.	Inhibit point	Reason	Remarks
1	Platen surface	To prevent stained paper	
2	Pressure roller surface	To prevent stained paper and poor feeding	The roller surface should be free of oil because grease is applied to the pivotal part of the pressure roller.
3	Pressure roller for bail bar	To prevent stained paper and bad feeding	
4	Ink ribbon	To prevent poor printing	
5	Pin tractor	To prevent stained paper	
6	Flexible cable	To prevent poor contact and cracked cables	
7	Motor board	To prevent poor contact	

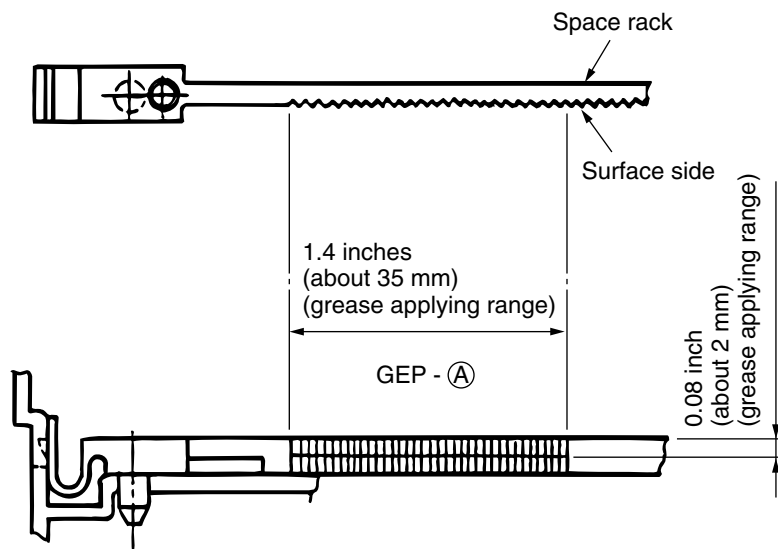
(5) Lubrication points

(a) Ribbon drive gear assembly



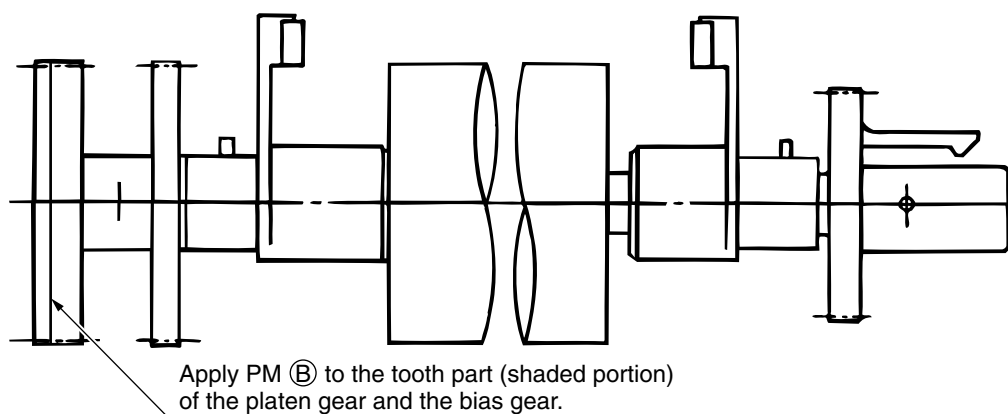
Note: The upper and lower part of the gear shaft should be oiled.

(b) Space rack

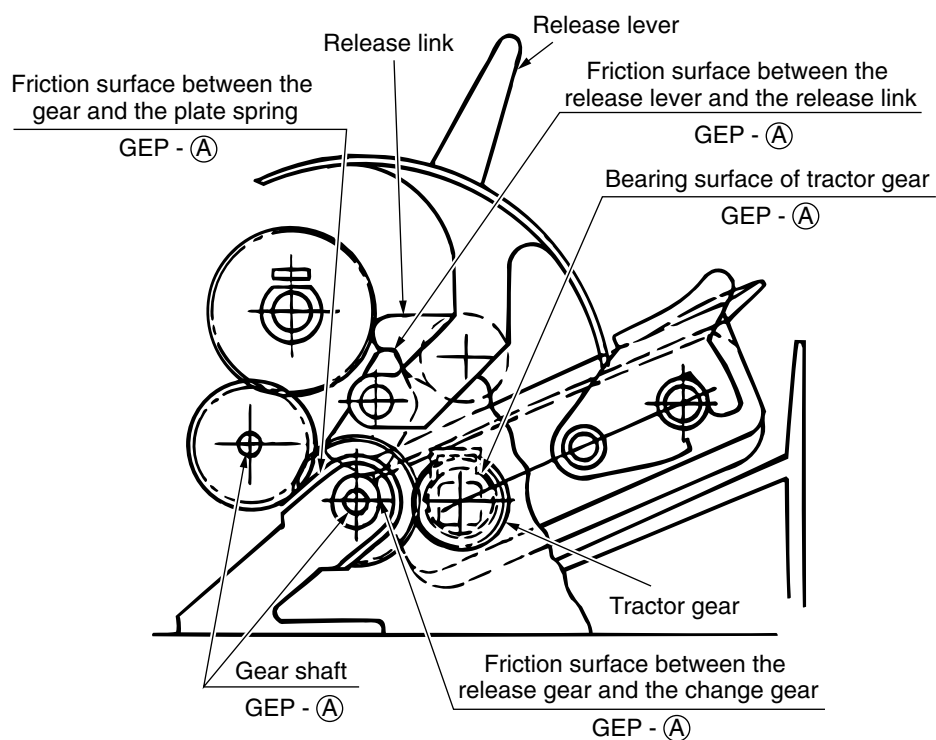


Note: Grease should be applied about 1.4 inches (35 mm) from the left end of the tooth section and to the shaded section about 0.08 inch (2 mm) from the rack top surface side.

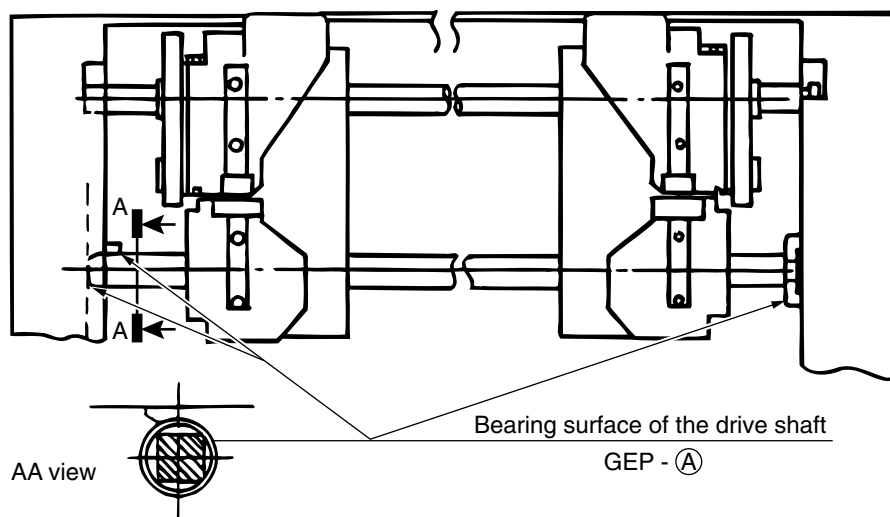
(c) Platen assembly



(d) Tractor driving system



(e) Tractor drive shaft



6. TROUBLESHOOTING AND REPAIR

6.1 Items to be Checked before Repair

If repair is requested by a user, check whether the printer can be fixed by the troubleshooting procedure described in the User's Manual.

If possible, ask the user under what conditions the trouble occurred, and record the answer.

Before troubleshooting, let the printer operate under the same conditions as when the trouble occurred and check whether the trouble is reproducible. If not, perform test printing and then proceed to troubleshooting.

6.2 Method of Troubleshooting

First verify the trouble condition, then locate the trouble in accordance with the detailed procedure given for each item in Table 6-1.

Before remedying the trouble, thoroughly read the precautions in Section 3.1.

The checkpoints for Control Board and Operation Board are shown in Figure 6-1, 6-2 and the connector locations and pin numbers are shown in Figure 6-3.

Table 6-1

Status	Details	Flowchart item No.
Trouble upon power-on	• Power is not supplied.	①
	• Spacing operation does not operate normally.	②
Trouble during printing	• Wrong character, character omission or dot omission	③
	• Line feed trouble	④
	• Malfunction of switch on operator panel	⑤
	• Data receiving failure	⑥

6.3 Lamp Display

(1) Printer mode display

Table 6-2

Printer mode		ALARM	SELECT	Contents	Remarks
Normal operation mode	ON LINE	OFF	ON	Indicates that the printer is ready to receive data and print.	
	HEX DUMP			Indicates that the printer is in hex dump mode.	
	LOCAL	OFF	OFF	Indicates that the printer is in the local mode.	
	MENU	OFF	OFF	Indicates that the printer is in the menu mode.	
Operator alarm	Paper end	ON	OFF	Form end, single sheet end, or bottom paper end	
	Paper jam			SASF paper jam	
	CSF paper jam			Paper jam or paper end, when CSF is installed	
	Print suppress	OFF	BLINK	Indicates that the printer is in the print suppress mode.	
fault alarm		BLINK	OFF		

(2) Fault alarm display

When the printer detects a variety of alarm states, these alarm states are displayed using LEDs.

Status displays for alarms are differentiated by MODE LEDs which are lit when the POW LED goes on and the ALM LED blinks.

The details are listed below.

Table 6-3 Alarm/Error Indications

Alarm	Severity	LEDs								Comment
		Primary Message			Detail Message					
		Menu	ALARM	SEL	10 CPI	12 CPI	17 CPI	20 CPI	PROP	
Paper Out	alarm	current mode	on	off	current CPI					alarm occurs 1" from bottom edge
Printhead Temp	alarm	blink	off	on	current CPI					after cool down, continues to print
MPU	fatal	off	blink	off	on	-	-	-	-	MPU internal RAM error
ROM	fatal	off	blink	off	-	on	-	-	-	Program ROM error
RAM	fatal	off	blink	off	-	-	on	-	-	RAM error
Spacing Motor	fatal	off	blink	off	-	-	-	on	-	Spacing error
Serial I/F	fatal	off	blink	off	-	-	-	-	on	Serial I/F board error

Note: Blink = 400 ms ON, 400 ms OFF (50% duty cycle)

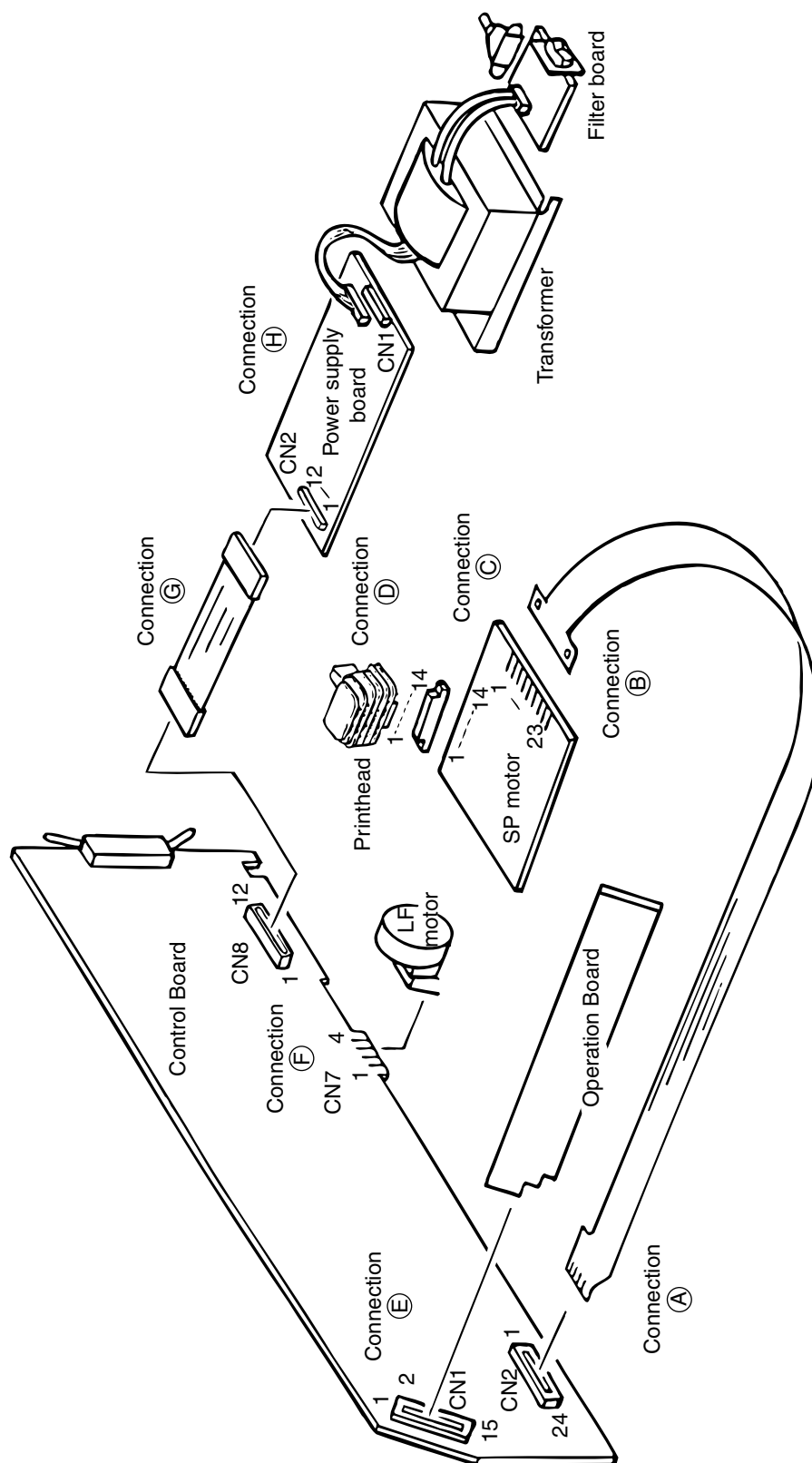


Figure 6-1 Connection locations and pin numbers

Table 6-4 Pin numbers and signal names (1/2)

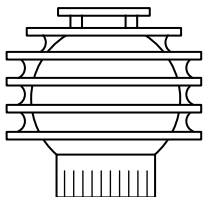
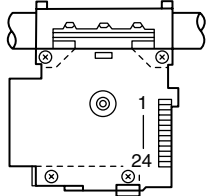
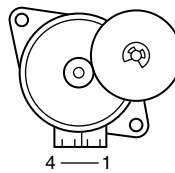
Name	Signal Name	Connection								Coil Resistance	Figure
		A	B	C	D	E	F	G	H		
PRINT HEAD	HEAD GAP	3	3							Approx. 18.8Ω	Pins on printhead Back of printhead  1 ~ 15
	TSD	10	10	7	7						
	+40V	8.9	8.9	8-10	8-10						
	+5V	20	20								
	SG	11.21	11.21	6	6						
	#1	16	16	1	1						
	#2	15	15	2	2						
	#3	4	4	14	14						
	#4	14	14	3	3						
	#5	5	5	13	13						
	#6	13	13	4	4						
	#7	6	6	12	12						
	#8	12	12	5	5						
	#9	7	7	11	11						
SP MOTOR	U	18								Approx. 21Ω	Pins on SP motor 
	V	17									
	W	19									
	φA	23									
	φB	22									
LF MOTOR	φ1						2			Approx. 6.8Ω	Pins on LF motor 
							1				
	φ2						3				
							4				
CN6	+40V							1-3			
	EP							4,5			
	+5V							6,7			
	0V							8,9			
	+8V							10			
	AC10V							11			
	ALM							12			

Table 6-4 Pin numbers and signal names (2/2)

Name	Signal Name	Connection								Coil Resistance	Figure
		A	B	C	D	E	F	G	H		
OPERATOR PANEL	SEL SW					3					
	MODE SW					4					
	LF SW					5					
	FF SW					6					
	PARK SW					7					
	TOF SW					13					
	PRINT SW					10					
	CHAR SW					12					
	LED' SD					2					
	LED SD CLK					14					
	+5V					1.15					
	0V					8.9					

① Power is not supplied

- Are AC cables connected correctly?

YES

NO

- Connect the AC cables correctly.



- Is the AC fuse open on the primary side of the Filter board?

NO

YES

- Replace the Fuse.



- Are + 5V and + 40V supplied to the Control board?

+5V : Measurement can be taken between CN8-7pin(+5V)and CN8-8pin(0V) (Control board).

+40V : Measurement can be taken between CN8-1pin(+40V)and CN8-8pin(0V) (Control board).

YES

NO

- Is the Fuse F1 open on the Power supply board?

NO

YES

- Replace the Fuse F1.



- Are the connections of power contact (CN8) normal?
(connection ㊿ part)

YES

NO

- Reseat the Control board.



- Replace the Power supply board or power cable.(See Section 3.3.12)



- Replace the Control board.(See Section 3.3.5)

② Space operation does not operate normally

- Is the carriage assembly binding or jammed?

NO

YES

- Check around the carriage assembly and the space motor to repair the mechanism.



- Are + 5V and + 40V supplied to the Control board?

YES

NO

- Check that the power cable of CN8 is connected correctly.

NO

YES

- Reseat the Power supply board.(See Section 3.3.12)



- Reseat the Control board or power cable or Power supply board.



- Is the head cable connected to CN2 correctly?
(connection Ⓐ part)

YES

NO

- Connect the head cable to CN2 correctly.



- Replace the Control board.(See Section 3.3.5)

- Remedied?

YES

NO

- Replace the Space motor.(See Section 3.3.15)



• END

③ Wrong character, character omission or dot omission

- Is the head cable inserted to CN2 correctly?
(connection ㉓ part)

YES

NO

- Reseat the head cable to CN2 correctly.
(connection ㉓ part)

- Replace the Print head.(See Section 3.3.2)

- Remedied?

YES

NO

- Replace the Control board.(See Section 3.3.5)
- Remedied?

NO

YES

- END

- Is the Space motor board contact pressure normal?
(connection ㉓ part)

YES

NO

- Reseat the carriage cable.

- Replace the Space motor.(See Section 3.3.15)

- END

④ Line feed trouble

- Manually rotate the platen knob.
- Does it rotate smoothly?

YES

NO

- Set the release lever to the open side.
- Does the platen knob rotate smoothly?

YES

NO

- Correct paper setting
- No foreign matter or dust on the platen gear, idler gear or drive gear.
- Smooth meshing of platen gear, idler gear and drive gear.
- Correct installation of push tractor assembly (R) or (L). (See Section 3.3.27.)
- Replacement of push tractor assembly (R) or (L). (See Section 3.3.27.)

- Is connection plate from LF motor connected with LF motor correctly?

YES

NO

- Connect it correctly.

- Is connection plate from the control board connected with LF motor correctly?

YES

NO

- Connect it correctly.

- Replace the Control board. (See Section 3.3.5.)

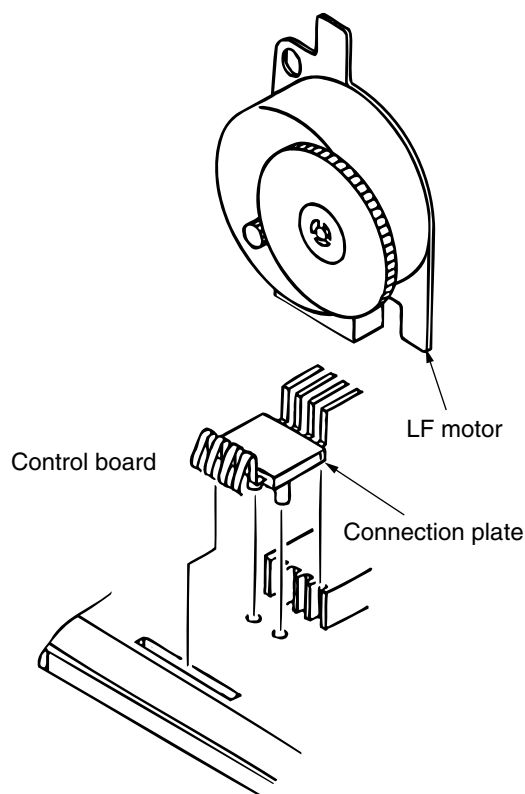
- Remedied?

YES

NO

- Replace the LF motor. (See Section 3.3.22.)

- END



⑤ Malfunction of switch on operator board

- Is the Operation board inserted to CN1 correctly?
(Connection ⑤ part)

YES

NO

- Connect it correctly.



- Replace the Operation board.(See Section 3.3.4)

- Remedied?

YES

NO

- Replace the Control board.(See Section 3.3.5)



- END

⑥ Data receiving failure

- Is the SELECT lamp on?

YES

NO

- Set to the SELECT mode.



- Is the interface cable connected correctly?

YES

NO

- Connect it correctly.



- Replace the Control board.(See Section 3.3.5)

APPENDIX A PCB LAYOUT

- (1) LXF-PCB (Control board)
- (2) LXS-PCB (Operation board)

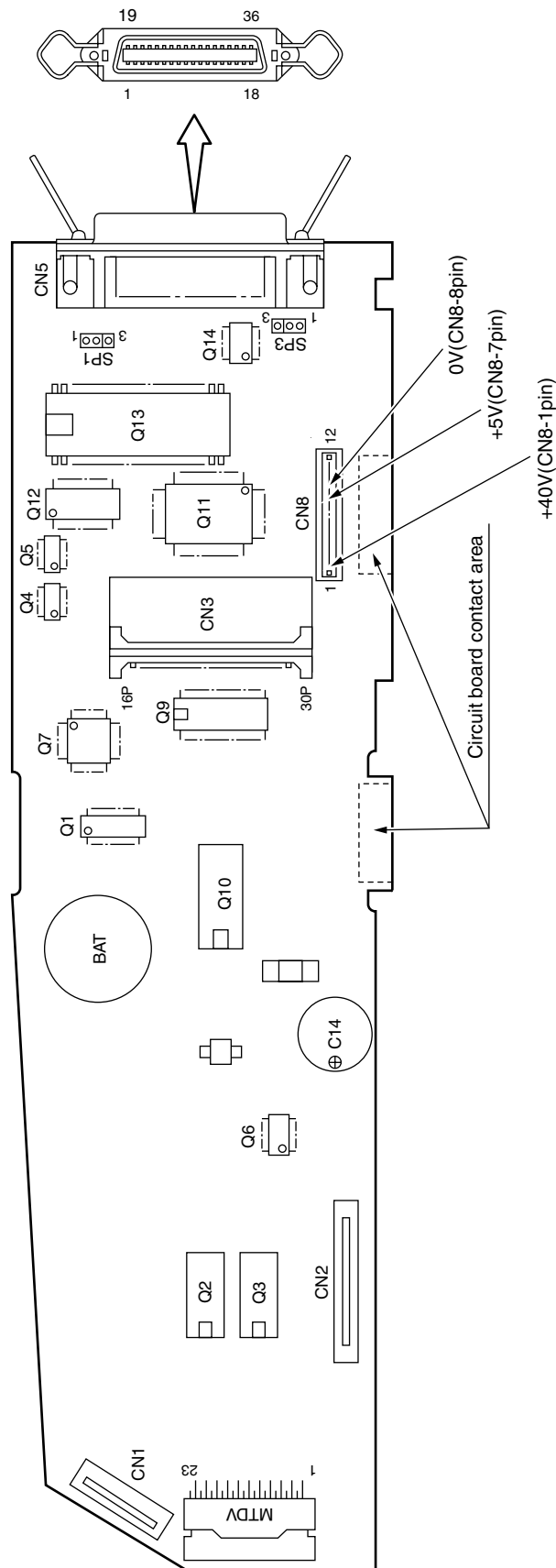
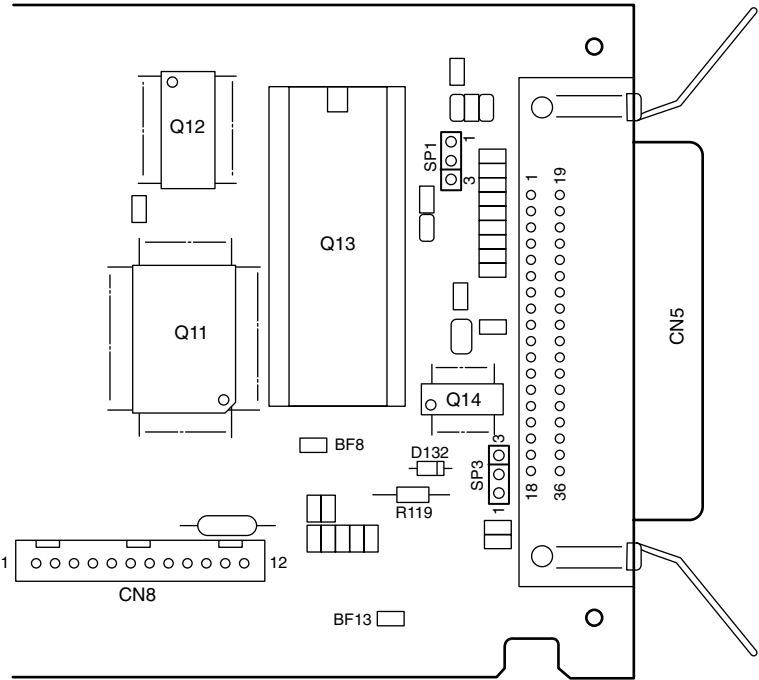


Figure A-1 Checkpoints of printed circuit board(Cotrol Board)

Supplement: Short plug setting



The table below shows the setting method for each application.
The definition of the setting is as follows :

1 :	1	<table><tr><td>○</td><td>○</td><td>○</td></tr></table>	○	○	○	3
○	○	○				
3 :	1	<table><tr><td>○</td><td>○</td><td>○</td></tr></table>	○	○	○	3
○	○	○				

SP1	SP2	SP3
1	—	1

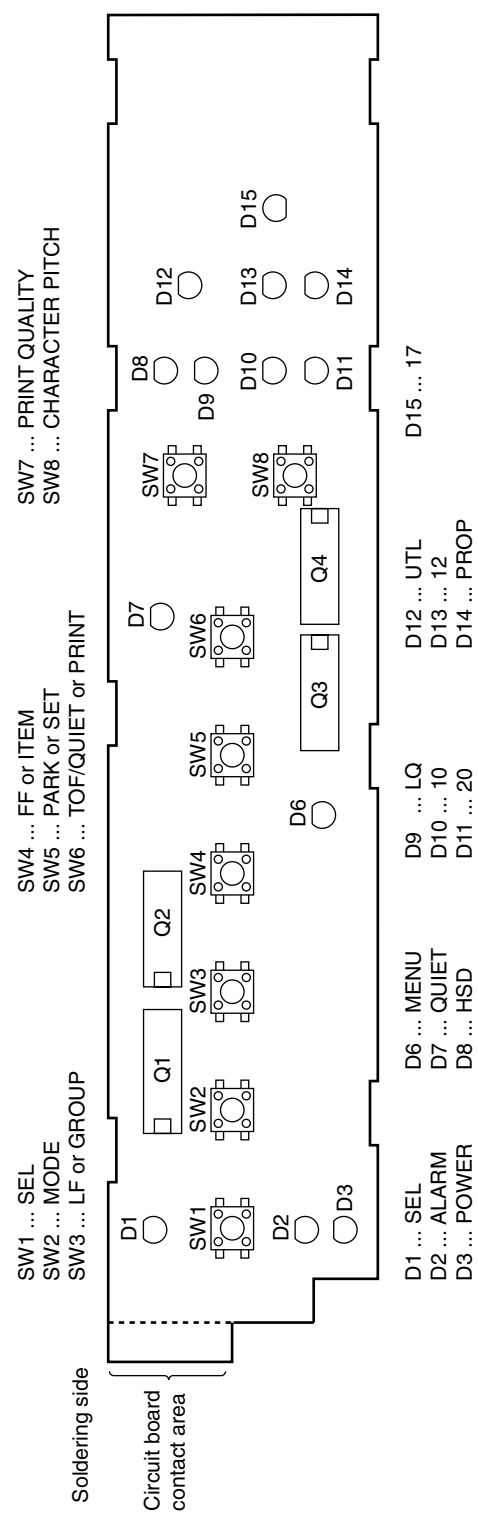


Figure A-2 Checkpoints of printed circuit board(Operation board)

APPENDIX B RS-232C SERIAL INTERFACE BOARD (OPTION)

1. GENERAL

This section describes the RS-232C Serial Interface board installed in the Printer as an option using a start-stop serial communications circuit. This serial interface board is capable of transmitting and receiving simultaneously at speeds up to 19,200 bits per second. Two protocols are available: Printer Ready/Busy and X-ON/X-OFF modes.

2. OPERATION DESCRIPTION

2.1 Element Description

(1) 80C51

An eight-bit microprocessor controller that controls the following:

- (a) Serial interface protocol and transfer of data through a serial port.
- (b) Message buffer.
- (c) Transmission of parallel data to the printer.

(2) 75189

An RS-232C standard line receiver.

(3) 75188

An RS-232C standard line driver.

(4) 5164AD

An 8192-byte static RAM used as a message buffer.

2.2 Circuit Description

A block diagram is shown in Figure B-2-1.

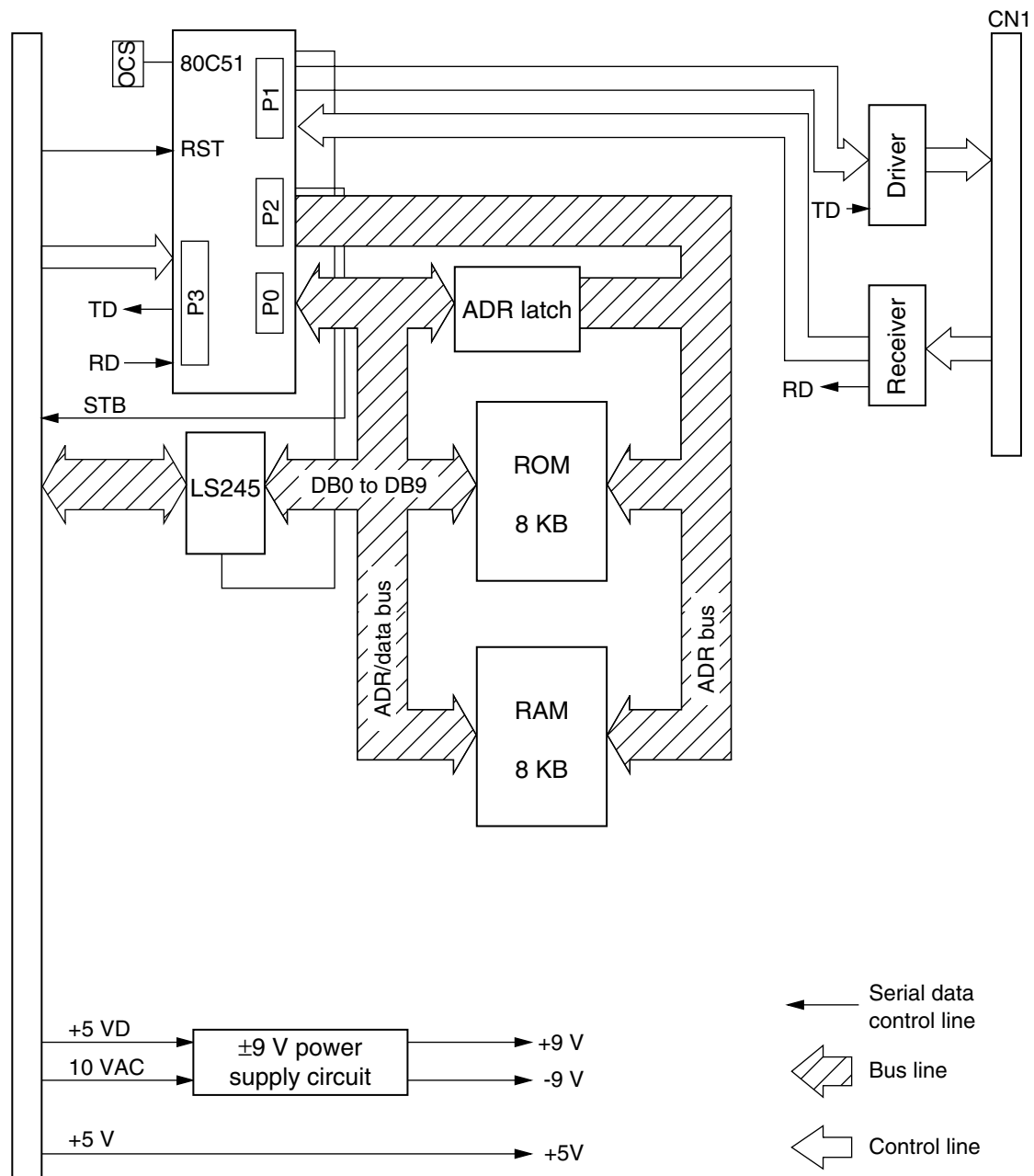


Figure B-2-1 Block Diagram

2.2.1 Operation at power on

After power is turned on, an RST OUT signal is sent from the printer control board which resets the printer. When the reset is completed, the 80C51 CPU performs initialization. Initialization consists of setting the menu, setting the 80C51 timer, and setting the serial mode.

2.2.2 RS-232C interface

The DTR, SSD, TD and RTS signals output by the 80C51 are converted to RS-232C signals by line driver 75188 and sent to the host.

In addition, signals DSR, CTS, CD, and RD on the RS-232C interface are converted to TTL level by line receiver 75189 and input to the 80C51.

2.3 Communication Procedure Flowchart

2.3.1 Mode (a)

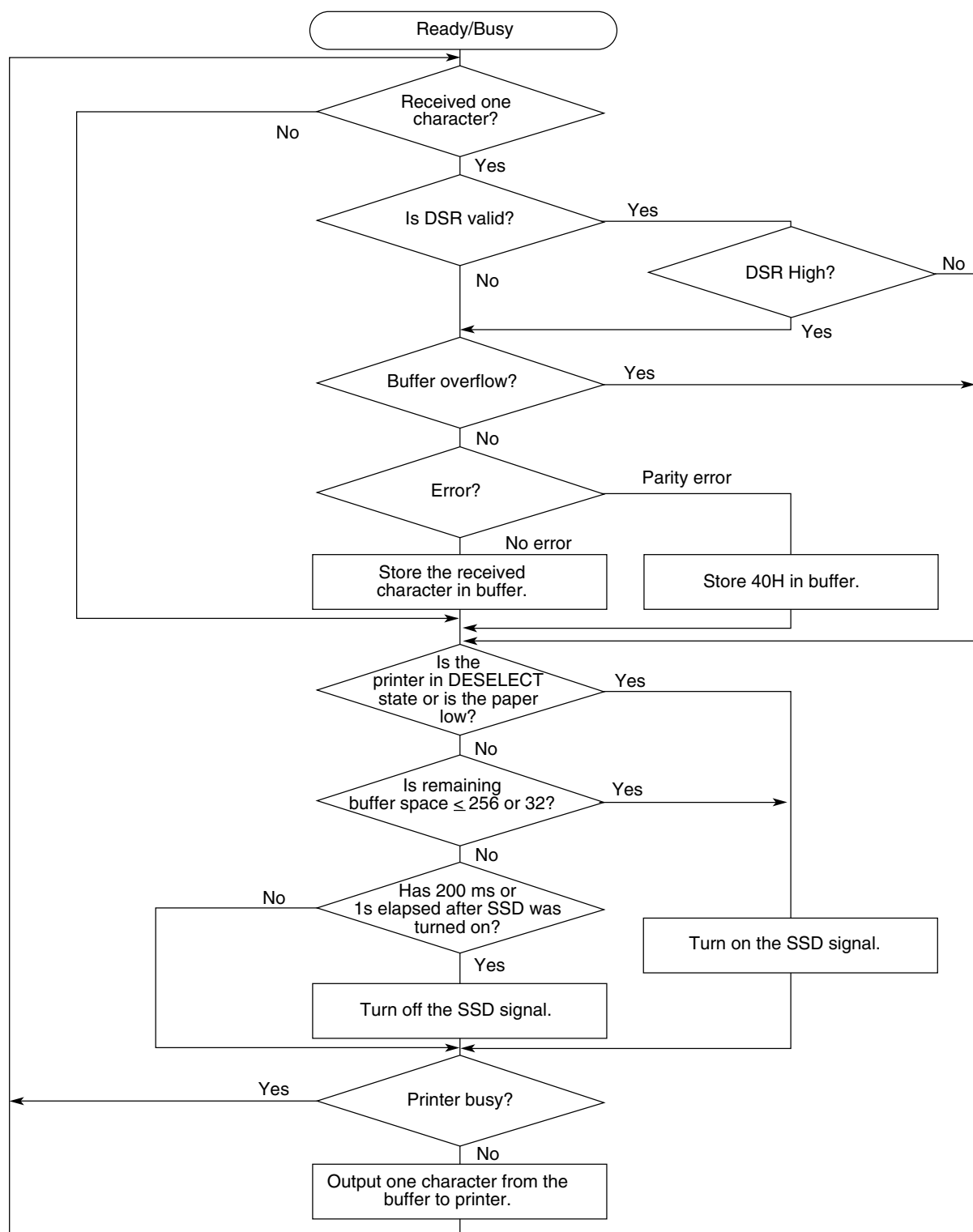


Figure B-2-2

2.3.2 Mode ②

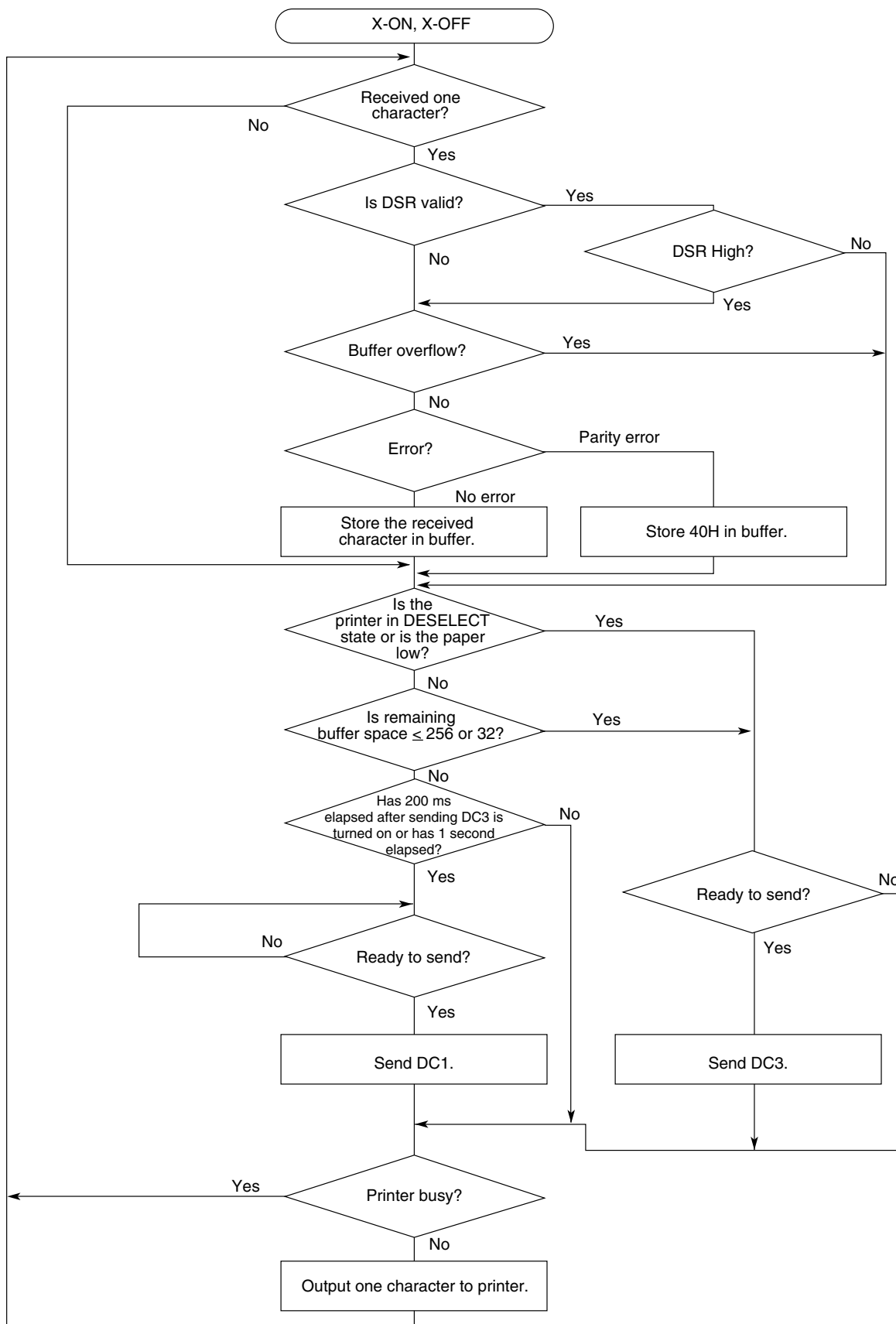


Figure B-2-3

3. TROUBLESHOOTING FLOWCHART

3.1 Before Repairing a Fault

If possible ask and record under what situation the trouble occurred.

Before troubleshooting, set up the printer to operate under the same conditions as those at the time of the trouble occurrence to see if the same trouble occurs again. If not, perform the self-test and thoroughly test the printers functionality.

3.2 Troubleshooting

- (1) Data cannot be received through the serial interface.
 - (2) In serial interface reception, some print data is skipped or the printer does not operate.
- ① Data cannot be received through the serial interface.

(Protocol is READY/BUSY state, BUSY LINE is SSD + .)

• Is the waveform of OSC as shown in Figure B-3-1?

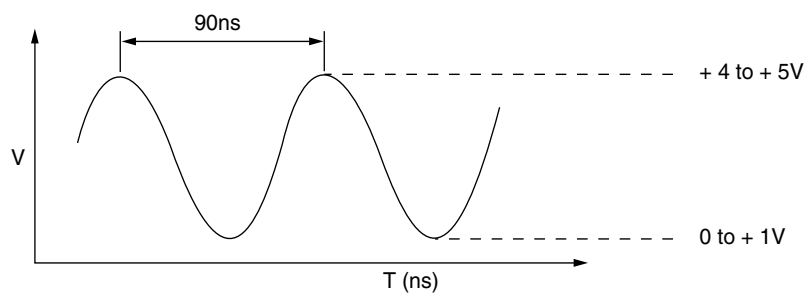


Figure B-3-1

- No Replace OSC.

• Yes Is RST signal of Q3 as shown in Figure B-3-2?

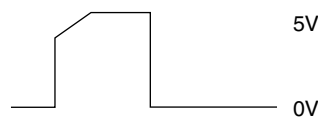


Figure B-3-2

- No Check the RST circuit on the Control board.

Ⓐ

A

- Yes Are ALE, $\overline{\text{PSEN}}$, $\overline{\text{RD}}$, $\overline{\text{WR}}$, and BUS signals of Q3 as shown in Figure B-3-3?

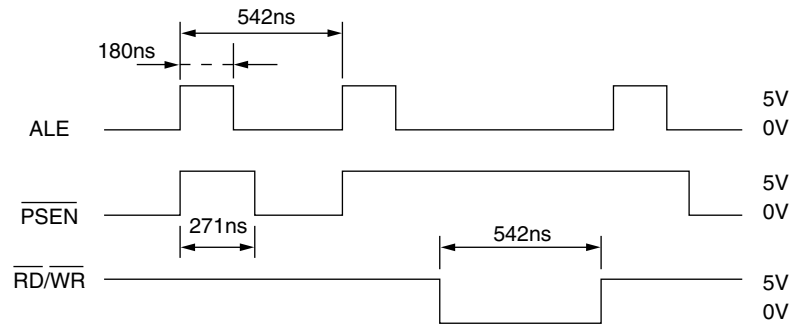


Figure B-3-3

- No Replace Q3.
- Yes Are T1 ($\overline{\text{SELECT}}$) and ($\overline{\text{BUSY}}$) signals low level?
- No Check Q11 on the Control board.
- Yes Are +9V and -9V output?
- No Replace components in the $\pm 9\text{V}$ control circuit.
- Yes Is SSD signal at pin 1 in Q3 High level?
- No Replace Q3.
- Yes Is SSD signal at pin 11 Q1 low level?
- No Replace Q1 or CN1.
- Yes Is RxD in Q3 as shown in Figure B-3-4?

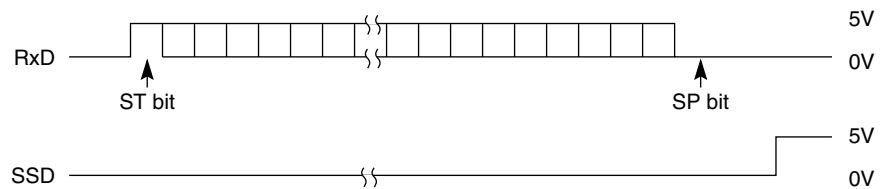


Figure B-3-4

- No Replace Q2.
- Yes Replace Q3.

② During serial interface reception, some print data is skipped or the printer does not operate.

• Are RxD and SSD in Q3 as shown in Figure B-3-4?

• No Replace Q2.

• Yes Are \overline{WR} and BUS signals at pin 3 in Q3 as shown in Figure B-3-5?

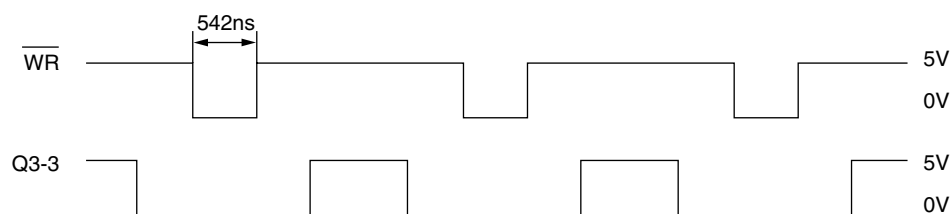


Figure B-3-5

• No Replace Q3.

• Yes Are Bus signal and DB0-7 in Q3 at the same level at \overline{WR} signal rise time?

• No Replace Q7.

• Yes The signal at pin 4 in Q6 the same as \overline{WR} signal in Figure B-3-5?

• No Replace Q6.

• Yes Check Q11 on Control board.

3.3 Local Test

3.3.1 Circuit test mode

3.3.1.1 Setting

- (1) Diagnostic test set by menu. Change Diagnostic test to "Yes".
- (2) Test connector

Plug the test connector shown in Figure B-3-6 into the serial interface connector.

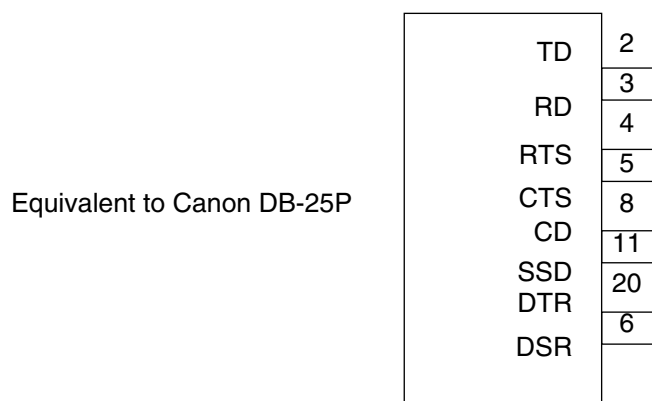


Figure B-3-6 Test Connector Diagram

3.3.1.2 Function

After the settings outlined in Section 2.3.1.1 are completed and power is turned on, the serial interface checks the message buffer memory and interface driver/receiver circuits. It then prints selected characters.

To start and stop this test, push the SEL switch on the front of the printer.

Details of this test are explained as below.

- (1) Prints the serial program revision.
- (2) Prints "LOOP TEST"
- (3) Check memory for message buffer.
- (4) Prints "GOOD" if the memory check is OK or "BAD" if the memory check fails.
- (5) Output Low to DTR, RTS and SSD signals. If one of the DSR, CTS, or CD signals is High, it prints "IF BAD". If the DSR, CTS, and CD signals are all Low, it prints "I/F = GOOD".
- (6) Output High to DTR, RTS, and SSD signals. If one of the DSR, CTS, or CD signals is Low, prints "IF BAD". If the DSR, CTS, and CD signals are all High, prints "I/F GOOD".
- (7) Transmits characters from code 20H to 7FH by SD signals. At the same time, characters are received from the RD signal and stored in the message buffer.
- (8) Prints the characters that were stored in the message buffer as indicated in (7).
- (9) Steps (1) through (8) are repeated until printer is deselected or turned off.